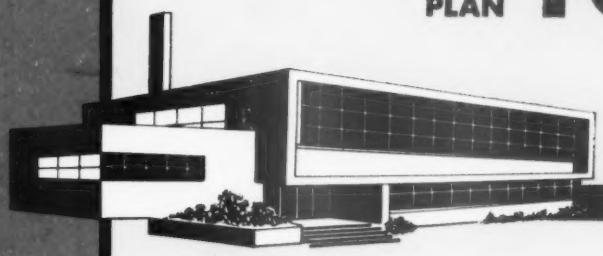
JUNE 1954 • IN TWO PARTS — PART II

FACTORY

MANAGEMENT AND MAINTENANCE



HOW TO PLAN YOUR 195X PLANT

WHY A 195X PLANT — AND HOW TO GET IT

Now's the time to start to plan. It's that — or else.

. . . SECTION A

BUILDINGS AND GROUNDS

They may be okay today. But not for tomorrow.

. . . SECTION B

ELECTRICAL SERVICES

Before you know it, you'll have to double them.

. . . SECTION C

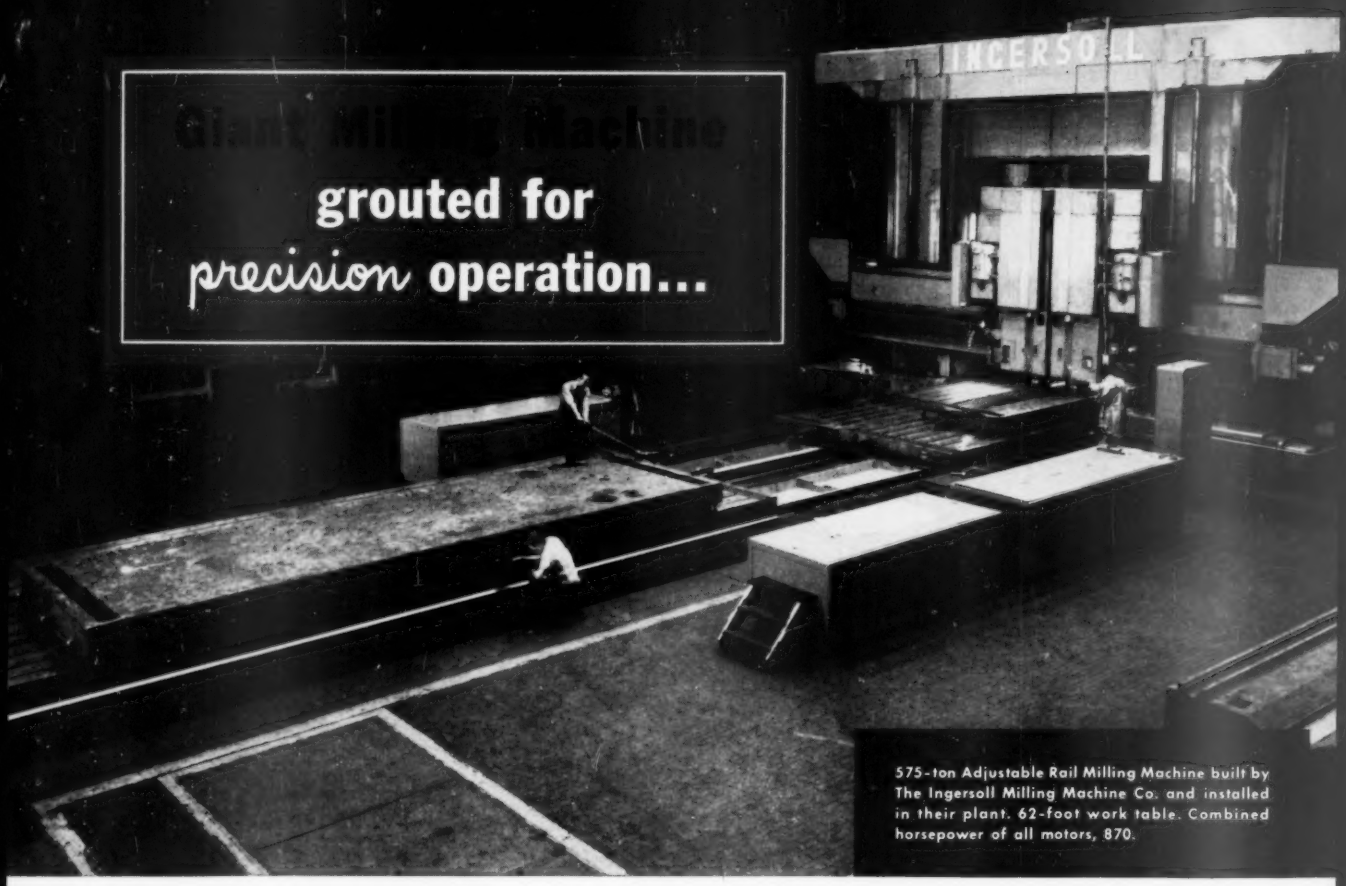
PLANT SERVICES

What you have now just won't do for 195X.

. . . SECTION D

A McGRAW-HILL PUBLICATION
FIFTY CENTS

grouted for *precision* operation...



575-ton Adjustable Rail Milling Machine built by The Ingersoll Milling Machine Co. and installed in their plant. 62-foot work table. Combined horsepower of all motors, 870.

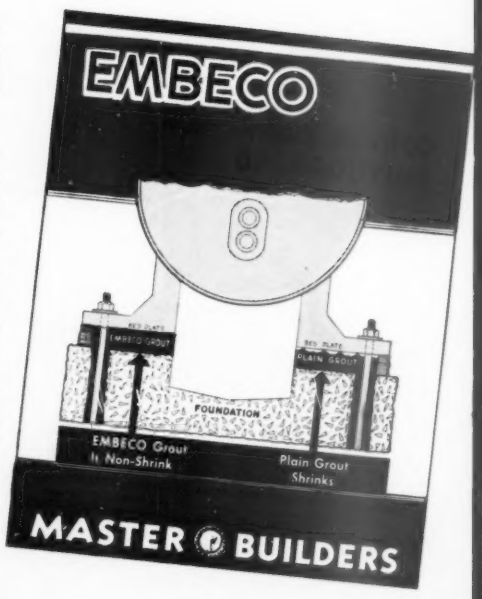
with non-shrink, ductile EMBECO* Mortar

How to grout this huge milling machine—one of the largest in the world—to maintain accurate alignment, was no problem for The Ingersoll Milling Machine Co. They knew from years of experience that a grout produced with Embeco would give long and satisfactory service.

By counteracting shrinkage and providing ductility, Embeco overcomes the two principal causes of failure in equipment grouts. Embeco produces an easily placeable mortar, yet insures full, level bedplate contact; sets in 6 to 12 hours; gives 7-day strength in 24 hours—50% greater ultimate strength.

These benefits are assured with Embeco whether your equipment is large machine tools, hydraulic presses, generators, engines, rolling mills, pulverizers, forging machines or other equipment subjected to impact, pounding action, vibration or wear.

Write for 16-page illustrated booklet, shown at right, giving valuable data on equipment grouting. Also reprint of article which appeared in The Plant—"Heavy Equipment Grouting Is An Art—Here's How It Is Done". No obligation, of course.



* Embeco is a combination of specially graded metallic aggregate, Master Builders cement-dispersing, water-reducing agent and ammonia-free oxidizing agents. Designed specifically to counteract shrinkage.

The MASTER BUILDERS Co.

Subsidiary of American-Marietta Company

FACTORY MANAGEMENT and MAINTENANCE · JUNE 1954 · IN TWO PARTS, PART II

YOUR 195X PLANT

HOW TO PLAN IT

SECTION A

Why a 195X Plant? A-2

Quick Ideas — to Help You Cut Modernization Costs A-8

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SECTION C

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SECTION D

Plant Services . . . . . D-1 to D-20

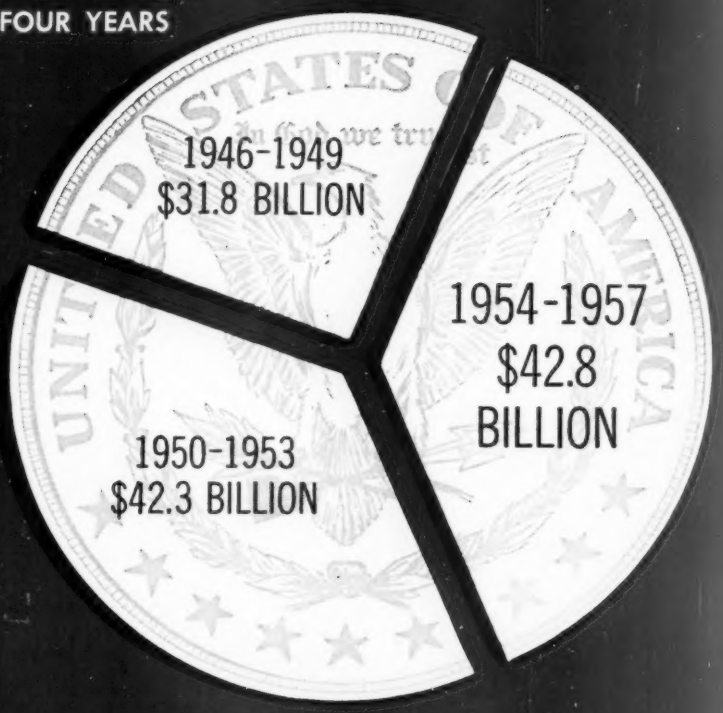
"YOUR 195X PLANT will have to meet the competition of plants created by the tremendous spending since World War II"

SPENDING IN THE NEXT FOUR YEARS WILL BE AT LEAST AS GREAT AS IN THE LAST FOUR...

1946-1949 • In this period, manufacturers spent $31.8 billion for new plant and equipment — built as much as for all of the previous 31 years.

1950-1953 • In these four years, manufacturers increased their rate of spending to a whopping $42.3-billion.

1954-1957 • For the next four years, manufacturers already have plans to spend another $42.8-billion—and say they will spend an additional $15-billion if business conditions look good.



EVERY MAJOR INDUSTRY HAS PLANS TO KEEP IT UP...

Petroleum	$1,156
Steel	3,636
Machinery	2,985
Electrical machinery	1,570
Automobiles	3,896
Transport equipment (including aircraft)	267
Food	2,803
Chemicals	5,413
Textiles	1,321
Other manufacturing	9,711
ALL MANUFACTURING	$42,778

THAT'S WHY IT'S TIME NOW FOR YOU TO START THINKING ABOUT...

By CARROLL W. BOYCE • Associate Editor, FACTORY

YOUR 195X PLANT...

Why you need it...

1. Everybody else is going to have a 195X plant. That's not literally true. *Everybody* else isn't going to have a 195X plant. But manufacturers *are* going to spend $42.8-billion (see pie chart on facing page) for expansion and modernization of plants and equipment in the next four years (up to $15-billion more if business looks good).

It's obvious that a large percentage of plants are moving rapidly toward becoming 195X plants. Whether a given plant becomes a 195X plant depends not only on how much money is spent, but also on how wisely it's spent.

2. The 195X plant can produce at lower cost than today's plant. Obviously, the manufacturing industries aren't spending billions on plant and equipment just for the sheer joy of spending. They're going to get more efficient, more competitive plants for their money.

3. You won't be in business in 195X without a 195X plant. Any business planning that isn't based at least in part on fear of what a smart competitor may do just isn't sound planning. And your competitors are making big, long-term plans aimed at taking business away from you. For details, see pages 68-71 in Part I of this issue.

What it is...

1. A 195X plant is a way of thinking. It's not a plant that will come into physical existence next month, next year, or even necessarily on December 31, 1959.

The key feature of any 195X plant — the one factor that will distinguish it above all others — will be the thinking and attitude of the owners, the management, and the workers in the plant.

2. A 195X plant is a reflection of available technology. You don't produce with nothing. Or with your bare hands. You produce with equipment. And it's not only the equipment itself, but how well it is housed and how well it is serviced that determines the efficiency of the manufacturing process.

The 195X plant will incorporate the greatest amount of the latest technology that the management's imagination and available dollars can provide.

3. A 195X plant is an expression of practical economics. "If we had unlimited funds . . ." is the wishful thinking approach to the 195X plant. It may be fun on a rainy afternoon, but it seldom gets you very far — except to spark ideas that can perhaps later be translated into reality.

From a practical point of view, the questions management must answer are these:

- Can we afford to have a 195X plant?
- Can we afford *not* to have a 195X plant?

The answer to that second question will loom more and more important as competition puts the squeeze on the plant that is anything less than a 195X plant.

4. A 195X plant is a new plant. Not just new by 1954 standards. A 195X plant is new all the time.

To keep pace with 195X, building, modernizing, improving, and making existing facilities obsolete must be a never-ceasing process.

How you get it . . . turn the page for eight ways

Eight Steps to Get Your 195X Plant

1 Remember that your plant building is a tool of production

Too often there's an inclination to think of the plant building as an end in itself. Certainly there is no such thing as a 195X plant building — except to the extent that a building is a part of a 195X "production system."

In many ways a plant building is like a bake oven. If your wife is typical, she probably buys a good-looking stove with a lot of gadgets on it, then sets to work figuring out what she can bake in the oven.

On the contrary, an industrial company usually decides first *what* it wants to bake; figures the required time, temperatures, and other conditions; then buys or builds an oven in which this process can take place most efficiently.

The oven, in either case, is a tool of production — for cooking your dinners, for baking billions of soda crackers, or maybe for baking the enamel finish on new car bodies.

It may be a flexible tool, or it may be a single-purpose tool, as indicated by the production requirements of the user.

But the oven is also a *housing*. It's a "plant building" in the sense that it performs the same structural functions — on a small scale — as the housing of your factory.

What are these "structural functions" of the oven — or of the factory building?

- To isolate the production process from the effects of unwanted external conditions (heat, cold, wind, rain, snow, etc.).
- To bring necessary services to the production process (controlled amounts of electricity, gas, oil, or coal, in the case of the oven).
- To permit efficient introduction of materials into the production process, and efficient removal of products from it.

There are lots more, but those are the essentials. Seen in that light, the plant structure is truly a tool of production.

The structure is the part of your production system that is most evident to the naked eye. So you'll want it to have some aesthetic as well as functional features. But even your wife, who puts a high premium on "good taste" in the appearance of her kitchen, wouldn't give a second thought to a handsome built-in oven if it lacked a thermostat or was so poorly insulated that it would heat up the whole kitchen.

As with any tool of production, functional considerations come first. Then you can add aesthetic values as long as the money holds out.

2 Plan your 195X production

Planning that is hampered at the outset by considerations of "how are we going to install that equipment in such-and-such place?" is sure to fall short of designing a 195X production system.

Compromises may have to be made later. Probably will. But if you accept any limitations at the time you're planning your production system, you'll never know whether or not you could have figured some way around those "limitations."

Planning on anything less than a "wide open" basis is a bit like the man considering the purchase of a new car, but whose garage is only 16 feet long. Should he limit his choice to cars of less than 16 feet (only three makes)? Or should he first figure that, because he has a large family and a pair of Irish setters, he really should have a big station wagon — and then try to solve the problem of where to keep it?

He has several choices. He can build a new garage; put an extension on the present one; rent a garage from a neighbor. Or maybe the weather in his section of the country is such that he can just as well leave the station wagon out.

In similar fashion, planning the production for a 195X plant should be a no-holds-barred project. All your efforts should be directed to creating a production system that is the most efficient that available technology and unlimited imagination and ingenuity can devise.

3 Plan the services needed for your 195X production

It's dollars-to-doughnuts that the services available in an existing plant — or even in the "dream plant" you might design out of hand — would be inadequate for your 195X production.

Since the end of World War II, the percentage of total new-plant cost spent on services has more than doubled — and it's continuing to rise. Actually that's not hard to understand when you consider all the additional mechanical equipment that our rapidly advancing technology has brought into industry. If you compute the actual services needed by the 195X production you have planned, you'll probably be surprised. Then, if you add a "safety factor" of 25% to 50% to provide for unanticipated needs, chances are within the next decade you'll be kicking yourself for "over-conservatism."

To get an idea of how the demand for services is growing, just look at a typical six-room "builder house." At the end of the war, 30-amp. electrical service with four branch circuits was considered adequate. Today 60-amp. service with 12 branch circuits is almost standard. And in "all-electric" areas (no gas available), 100-amp. 230-volt service with 20 branch circuits, plus an additional 60-amp. feeder for a hot water heater, is not unusual. As a

matter of fact, in one such house recently completed, the addition of year-round air conditioning to the load of kitchen and laundry appliances makes that service inadequate — circuits had to be doubled up, and now there's a voltage drop.

4 Plan the structural features needed for your 195X production and services

When you know the process and equipment and services —and how to fit them together into the most efficient production system — you're ready to start planning the *functional* requirements of the shell needed to enclose that system. Not bricks versus steel. But floor loads, overhead clearances, bay widths, provisions for shipping and receiving, requirements of materials handling systems, need for one-floor or multi-story treatment of various elements.

It's a lot like planning a new home. Even though you may have already decided as a matter of taste that you want New England Colonial or California Contemporary in the final design, you start by giving your architect a bill of requirements: Sleeping quarters for yourself and your wife, for so many children of such-and-such age and sex, for so many guests; space to prepare and serve meals for a certain number of people; storage space for your present and anticipated clothing, china, books, etc. And so on.

Note that you still haven't designed a structure in the conventional sense. You have written the functional specifications of the structure in an engineering sense. Only when this latter job is completed are you ready to start thinking about translating your production-system-on-paper into bricks and mortar.

And remember, you still haven't looked at your present plant—or your bank account.

5 Consider a physically "all-new" building

This is the point where you can start drawing actual building plans. Not the detailed working drawings, but complete enough so that you can get an accurate picture of *operating* costs as well as construction costs. Too many companies stop at the point where they find out that a new plant will cost so many dollars. "Too much," they say, and the issue is closed.

The key question to be answered is what effect this all-new production system will have on unit costs at re-evaluated market potentials based on these new costs.

The new plant gives you complete freedom to change location—if that seems indicated by supply, market, and labor factors. It gives you freedom to adjust capacity levels—if the estimated reduction in unit costs indicates an expanded market.

These are elements that must be taken into account when you sit down to figure your potential profit position after building "all-new."

6 Consider building 195X features into your existing plant

Here's where you may have to start making compromises. If the 195X production you have planned can be fitted into your existing plant without rearrangement, wonderful! Just be sure that the building also has (or can be made to have) the services and structural features required.

Far more likely, you'll have to make changes in your 195X production plan. Keeping in mind that such changes will also alter the requirements for services and structural features, you'll have to jigger and re-jigger until you finally come up with a balanced "package."

Probably you should come up with three or four packages, representing different levels of capital expenditure for service and structural changes—because, obviously, if you spend enough money, you can do almost anything with an existing plant. To see where you land in the final operating cost analysis in each case, you might shoot at capital expenditure for alterations representing 75%, 50%, and 25% of the cost of an all-new plant. In rare cases, you might go to 100%, but it's generally sentiment alone that brings anyone to spend the price of a 1954 car on patching up a 1937 model.

For each of your modernization proposals, make an estimate of profit position based on unit cost at re-evaluated market potentials.

7 Consider a combination of modernization and building new

There's no rule that says you have to build all-new or else depend entirely on modernization. Where it looks as though it would be excessively expensive to modernize your present plant to house certain elements of your 195X production system, maybe you can "split" your system. Build new for part of it only. That way you may have to sacrifice fewer of the 195X features. Whether you have lost more efficiency than you have gained by splitting will show up when you translate the proposal into an estimate of profit position based on unit cost at re-evaluated market potentials.

8 Weigh the alternatives

Arrange the various proposals in the order of favorable future profit position, then ask yourself these two key 195X questions about each one:

- **Can we afford to do it?**
- **Can we afford *not* to do it?**

The first time you come to a proposal about which you can honestly answer "Yes" to the first question or "No" to the second question, you will have determined how far and how fast you are going to move toward 195X.

Quick Ideas—to Help You Cut

KNOW YOUR GOALS before you start. Get them down in writing. And be concrete. If your goal is replacement of worn-out facilities, or improvements to cut operating costs, or additions to provide for growth of sales, or additions or alterations required for new products, or improvements in old products—get it written down. Otherwise you may lose sight of your goal—get off on costly tangents.

GET EVERYONE INTO THE ACT. It's the only good way to start. Make sure all affected know the objective, and results expected. Get the reaction of everyone who'll have to supervise, operate, and maintain the new facilities.

USE MODERNIZATION as a springboard to make basic changes in flow, handling, and processes. Unless you do, you'll end up with something larger, but no more efficient, than what you started with.

ALWAYS START WITH A REVIEW of your existing plant facilities. The three A-B-C Rating Charts (pages B-2, C-2, D-2) will help make that easy. So will the A-B-C Rating Chart for Plant Operation in Part I. Use them. Then you'll know where you stand.

GET DOWN IN WRITING what you need to get for 195X efficiency. The A-B-C Rating Charts will tip you off. Remember to list "must items" first. New process flow sheets, new production area space requirements should be included.

GET AGREEMENT ON SPACE requirements from all department heads involved — particularly any that will lose space.

MONEY IS EXPENSIVE. So get all your costs down in writing before construction begins. Include:

- Capitalizable costs.
- Costs you can expense.
- Cost of dismantling old facilities or outworn equipment.
- Income from sale of old equipment.
- Salvage value of equipment and materials to be scrapped.
- Expected annual operating savings before and after depreciation.
- Years to recover cash outlay before and after depreciation and taxes.
- And, finally, how you'll spend the money —how much each quarter.

SEGREGATING ALL CONTRACTS into "expense" and "capital" items helps you make sure that all possible costs are expensed. With inadequate planning and records, you may be forced to capitalize costs unnecessarily.

BI-WEEKLY COST RECORDS should be issued, including such items as amount of contract, amount committed, amount already paid, amount over-expended. Such reports will help you keep track of progress, as well as nip trouble in the bud.

INVESTIGATE TAX ADVANTAGES in organizing an "arms-length" company to build your plant additions and lease them back. *Warning:* Get expert tax and legal advice first. You may also be able to add equipment and facilities to the plant on lease-hold improvements.

BE YOUR OWN GENERAL CONTRACTOR, or at least consider it carefully, if you have the manpower to handle the job. General contractors often subcontract most of the work anyway.

PAUSE BEFORE YOU TACKLE big modernization jobs with your own workforce, though. It's better to contract outside for work unfamiliar to your people, or work that is heavy or hazardous, such as erecting structural framing. Don't build up an organization just to do the job.

WINTER MONTHS ARE GOOD for inside work—and not just because it's cold outside. Winter's the off-season for contractors—and you stand a good chance of getting top quality work at a less-than-top price.

Modernization Costs

IN AND OUT FAST! That is—and should be—the rule for outside contractors. Then your workforce can do modernization work assigned to it, without interference or conflict with the contractor's workers. Careful scheduling makes it possible.

CHECK ON CONTRACTOR'S record, unless you want to invite trouble. In some states (Ohio, for example) the owner has a contingent responsibility for paying all material, labor, and subcontractor's claims, in case of default by the contractor for any cause. In short, you're stuck with his bills. So check local and state laws. And investigate the protection of a completion bond. Best protection, though: Make sure bidders are qualified.

A TIP WHEN GETTING BIDS: Send along a copy of the contract you'll want signed, so prospective contractors will know your terms on such angles as the following:

Amount of contract, terms of payment, overtime, workmanship and materials, correction of defects, protection of equipment and property, supervision, subcontracting, removal of debris and cleaning of site, carting to job site, storage of equipment, purchase of materials, insurance permits and licences, surety bond, liens, termination on default of contractor, terminations at convenience of union, other important contract provisions.

Why? No sense in wasting time getting bids from contractors who won't buy your terms.

INTERRUPTIONS TO PRODUCTION should be covered in specifications. Otherwise, you may find the contractor calling for unexpected shutdowns—or delaying his work until you can shut down.

CONSIDER USING CONSULTANTS — process specialists in your industry—if you're planning modernization of processes along with building modernization. But have your staff feed them all possible information. After all, you know your own plant and problems better than anyone else.

ADEQUATE INSURANCE — liability, fire, property damage, and comprehensive — is a *must*, to protect your company during modernization. And be sure that you have enough to cover all contingencies.

CHECK THE INSURANCE COVERAGE of all contractors on the job site. Make sure they have special protection for ticklish construction jobs, like underpinning and tying into existing services, which could result in damage to or loss of existing equipment, or loss of production. A certificate of all contractor's insurance should be forwarded to you. Your legal department or legal advisor should review the certificates before construction begins.

THE POWER YOU WANT WHEN you want it is not always available. Early in your modernization plans, visit your utility company, make sure they'll be able to supply your 195X demand. And if not, you can start figuring together what to do about it.

PURCHASE NEW EQUIPMENT you'll need on a competitive basis, whenever possible. But before making a selection, work out an analysis sheet including not only relative price, but delivery, deviations from specifications, escalator clauses, and so on. The lowest bid may not be your best buy.

WATCH THOSE MISSING LINKS! That is, don't let the delivery of any one of a group of new equipment items fall behind. The one that's missing is bound to be a "closing-in piece" that will delay completion of a project.

IT'S CHEAPER TO MAKE CHANGES on a drawing than on the job. So check both your preliminary and final construction plans with your state labor department, city government, insurance underwriter, and others, for possible code violations.

For more quick ideas, turn the page

MAKE ONE MAN RESPONSIBLE for over-all field supervision. And be sure to supply him with complete drawings, specifications and contracts —he can't be any better than you make him with the information and help you pass on to him.

KEEP PLANT RECORDS UP-TO-DATE— records on equipment installations, machine and special foundations, structural changes, changes in underground facilities, etc. Adequate records, usually in the form of up-to-date engineering print changes, are a great help when modernization is planned. Such good records save the modernization designer time, hence they will save you money.

Best ways to keep track of what happens about the plant are to make print changes mandatory and to keep a comprehensive log on engineering and construction activities affecting the plant structure and its contents.

WHERE'RE WE AT? That's what everyone wants to know. Keep top management—and all others involved in planning and authorizing expenditures—informed on how far along the project is physically, and how much money has been spent to date. Give reasons for delays (equipment not delivered, craft jurisdictional problems, bad luck with weather) and unplanned expenditures. Monthly is not too frequent—you can spend a lot of money in a month.

WATCH THOSE FENCES! Often overlooked is the fact that a fence too close to the building encourages employees to toss tools and other items over, to be picked up and carried off later. Parking lots inside the fenced area have the same effect. Review your fence locations, and if necessary make relayout part of your modernization program.

NO SENSE MODERNIZING AT ALL, if your floors can't take it. Check floor load capacity and bay size before extensive modernization is planned. If either is inadequate for your 195X processes or equipment, your building may be beyond the modernization stage.

PROGRESS PHOTOS can cut costs later, especially if they cover the installation of underground utility lines and service. Alteration of these any time after construction is completed is greatly simplified by having good photographs on hand to show just how the lines and equipment were installed originally. It's usually best for the plant engineering and maintenance department to specify what should be covered by such a photographic record.

USE CONSTRUCTION MOVIES to augment "still" photographs in keeping home office executives and engineers informed on building projects at other cities. Plant companies use movies to augment "still" photographs of construction progress. Films shot on location can be developed quickly for high-speed reporting to centralized engineering staff. Movies help them to chart progress accurately, and help them evaluate new methods of construction.

YOU CAN'T PUT OUT A FIRE without water. So be sure any new site is supplied with adequate water pressure and volume. If it's not, your fire insurance rates will take a big hop. The alternatives — a reservoir and fire pumps, or an elevated tank — can put a large dent in your appropriations.

LIGHTWEIGHT FIREPROOFING of structural steel can be accomplished by applying metal lathe membrane fireproofing using a plaster compounded with perlite or vermiculite. These aggregates weigh less and insulate better than ordinary concrete fireproofing.

Here's a cost comparison based on fireproofing an 18-in., wide-flange, 50-lb. beam or column. Concrete fireproofing would cost about $4 per linear foot and materials would weigh about 225 pounds per linear foot.

Lightweight plaster for the same purpose, on the other hand, would weigh about 25 pounds. This would cost only $2.75, and would be fully effective.

LET YOUR NEW FLOORS TILT to the slope of existing mild grades. Such slope is not noticeable in large plant areas and helps to cut the cost of cutting and filling earth. Ford Motor Company engineers tell us Ford has followed that practice successfully in some instances.

SEWERS CAN BE A HEADACHE TOO. An expansion at your existing location might increase your output of process and/or sanitary wastes enough to bring the law down on you. Check early in the game, and if you will be out-of-bounds, make plans for waste treatment.

DON'T BLOCK that future expansion by locating your power plant, main substation, reservoir, pumping station, waste disposal plant, garages, fire station, storage building, test facilities, water tower, or other auxiliary buildings carelessly. Keep them out of the path of any possible future expansions. Relocating such structures will be costly.

AND FUTURE EXPANSION of these auxiliary buildings and facilities will probably be necessary when you enlarge your plant later. So plan for it now.

A BUILDING FRAME WITH inadequate capacity for future use will be a headache. Don't forget, when designing the frame, that you may some day want to hang conveyors, process equipment, plumbing and piping, electrical equipment, mezzanines for offices or employee facilities from it. Or put a roof cooling pond or water cooling tower on top of it. And poor structural design often spells poor resale value for the plant.

A PROJECT FOLDER, including notes on preliminary thinking and engineering, basis of design, minutes of conferences and other important discussions, lists of appropriations, and so on, should be kept carefully up to date. It will provide a factual record for later discussion of problems that arise, help you check how well you met your objective.

JUST AS IN BUILDING A HOUSE, changes and extras are expensive and embarrassing. A good trick to hold them to a minimum: Make your policy on changes and extras so tough that only the important ones get through. But don't straight-jacket yourself to the point where the important ones can't get through. Require from the people requesting the change a detailed explanation of the need for it, an estimate of the cost of re-engineering, and also the increased (or decreased) cost of the project. The change should be reviewed by all department heads affected, and by top management if a cost boost is involved.

FIRE-RESISTANT ROOF CONSTRUCTION is now specified by many companies for new plant buildings.

One company we know erected various test structures containing a variety of materials, burned them, analyzed results. One result was to eliminate use of flammable and vaporizing materials in contact with metal roof deck. Vinyl vapor barrier sheets and other non-flammable sheets are now being used. And non-running, non-burning roof adhesives have been investigated and put to work.

A LIGHT-DUTY PAVING in the parking lot will be good enough if you can be sure you can keep heavy trucks off it.

A CLOSING-OUT REPORT is of prime importance. When the project is completed, find out in detail how much money was spent, whether any work remains to be done. If so, it may be smart to close out the appropriation, clean up minor items on another order. But let top management know, so that the over-all cost of the program is not distorted.

DON'T BURY THE CLEAN-UP items in various operating budgets for convenience or to hide embarrassment over missing the scheduled project budget. If you do, something (probably maintenance) will have to be slighted in order to keep the operating budget balanced.

COMPLETED NAVAL VESSELS are turned over to "operating personnel" by the engineers and builders in a formal commissioning ceremony, complete with flags and martial music. You don't have to go that far, but those responsible for designing and engineering your new plant or modernization should review the project in detail with your operating personnel, supply them with a folder on operation of all new equipment, a suggested preventive maintenance program for building and equipment, and assist in whatever special training of new people is required by the new facilities.

HOW'D WE DO? Make sure you find out. After you've had a chance to get your new facilities rolling, go back to your original reasons for the modernization or new facilities. Ask snoopy questions to find out whether you met those objectives. Have your costs been cut the way you thought they would be? Have you replaced all worn-out facilities? Do you have the capacity for that looked-for growth in sales? Here's where you'll be sorry if you didn't follow our first tip—"Know your goals before you start; and get 'em down in writing."

PROJECTS COMPLETED

1 • Modern new four-story administration building has replaced old office building, which was razed. New one erected in its place.

2 • Penthouse on administration building contains executive dining room, kitchen, guest restroom and shower, air conditioning rooms.

3 • Two parking lots for office employees were added here, one at each end of administration building.

4 • New sales demonstration and product display room was built within plant at this location.

5 • Newly modernized factory area, previously occupied by factory offices. Area relighted, painted, floors improved, bus duct installed, etc.

6 • New packaged substation for this factory building installed here. Adjacent to outdoor transformer bank.

7 • Shop employees' parking area resurfaced and improved.

8 • New incinerator installed for refuse disposal.

PROJECTS IN PROGRESS

X • Replacing old wiring with bus duct in this building. Most of remainder of plant is now bus-duct equipped.

PROJECTS FOR FUTURE

A • Area of main plant building still to be re-roofed. Re-roofing completed elsewhere.

B • Present open area between two main factory buildings to be roofed over and floored to yield new manufacturing space.

C • Will replace main aisles here. Other aisles throughout plant have been armored, widened, or resurfaced.

D • Will install new lighting in these buildings. Relighting has been accomplished elsewhere.

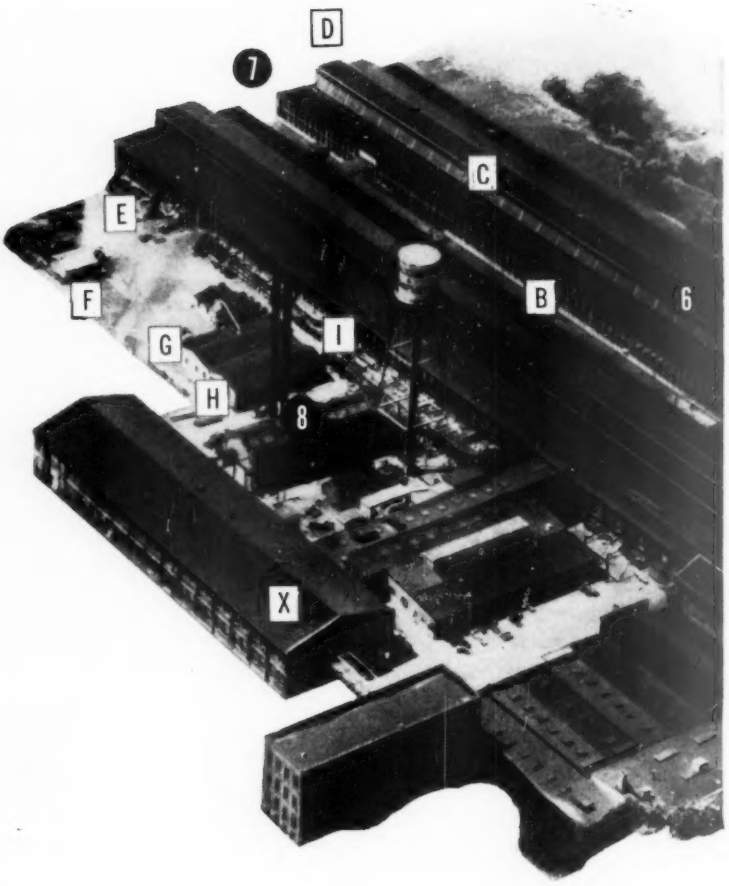
E • Lumber storage building (H) will be moved here from location shown to get it next to the crating and shipping departments for greater efficiency, and to clear the yard for storage.

F • Small yard building to be removed.

G • This building to be razed to create more yard storage space.

H • Lumber storage building.

I • Small-casting storage area will be expanded and improved.



Shot from the air shows

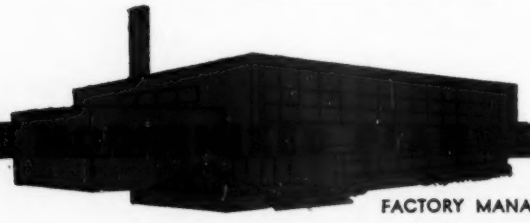
how The Lodge & Shipley Company is . . .

Modernizing in Easy,

By THOMAS T. KLING • Vice President and Works Manager
The Lodge & Shipley Company, Cincinnati

As you can see, we've come a long way since our modernization program started in 1950. Back of the work that's been done and remains to be done, there's a lot of planning and organization.

In 1950 we realized the time for action had come. The depression had prevented substantial plant improvement in the 1930's. War production kept us too busy for modernization during the 1940's. By 1950 the pressure for more manufacturing capacity, and more efficient shop and office facilities, had come to a head.



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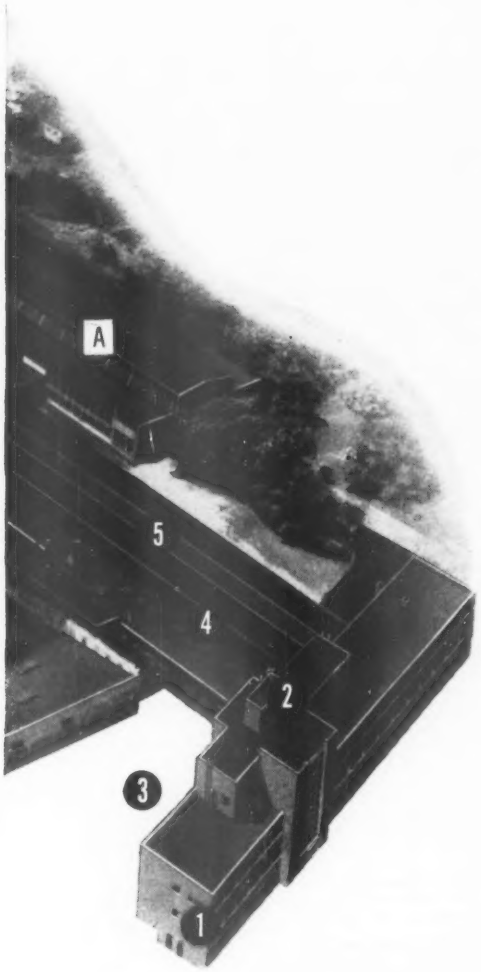


Planned Stages

Modernize? Or Build New? We decided to modernize for three important reasons:

1) War production had emphasized output at any cost. Some of those expensive operating habits had hung on, leaving us without a large cash kitty.

2) The money that we did have was mostly scheduled for investment during a comprehensive machine tool purchase program. Our producing equipment had to be modernized, just as the plant did—but equipment had the priority.

3) Our top management level was not heavily staffed. We weren't able to divorce enough executive time from daily operations to keep tabs on the construction of a new plant at another site.

And 1950 was a year of decision for two more reasons: The excess profits tax was in force. And a Certificate of Necessity could be obtained. Scheduled continuation of the tax for two to three more years would give us a break financially, and a certificate would enable us to write off quickly those costs that could not be expensed.

How We Organized · Normally our executive group settles most of our major operating problems, and makes key decisions. It's comprised of our president, works manager, chief engineer, plant manager, controller, vice president for sales, and director of industrial relations. So it was only natural that this group should make the initial and major decisions at the start of our modernization program. They decided:

1) To stay at the same site and modernize the plant, as opposed to building new, for the reasons given earlier.

2) How much money we could spend on modernization, and when it should be spent.

3) To fix major authority and responsibility for factory modernization on a group of three men—works manager, plant manager, and plant engineer.

4) To engage a consulting firm to study our plant layout and flow of operations.

5) To build a new office building at once.

As planned, the new office building got first attention (you'll see the results on the next pages). Once it was completed, factory offices that formerly occupied about 20,000 square feet in the shop area were moved in. And our program to improve the production area got underway.

Factory Improvement · Our basic aims were to: (1) get the most for our money, (2) repair or replace the most critical areas and equipment first (although the estimate of what is critical is liable to change), (3) improved facilities in a logical sequence—to avoid costly "second generation" moves.

To accomplish these aims, two things were done:

• **The consulting engineers developed a plan for relocating many of our production and service departments.** Their assignment was to find us the most efficient layout obtainable at lowest cost.

By mid-1951 their report was ready, and we had taken stock of our plant's condition. The report detailed for us a plan for relocating departments in checker-game fashion—i.e., an area would be vacated, modernized, and then reoccupied.

The proposal was approved, and became the

basis for our master plan for immediate and future work.

• **Meanwhile a priority list for plant improvement projects was set up by our three-man committee.** And they decided which jobs should be done with our own force, and which ones let out.

We now knew our goal, and had the entire program laid out in planned steps to be tackled as income and business outlook permitted. Many of the improvements could be made simultaneously.

CONDITION OF PLANT	HOW LODGE & SHIPLEY MODERNIZED	STILL TO BE DONE
BUILDING FRAMES • Four buildings damaged in fire 20 years ago. Also, termites active in wood columns.	Jacked up buildings. Replaced wood columns and beams with structural steel salvaged from old office building. Bolted structure to simplify work. Borrowed shoring from contractor building new administration building.	Will replace purlins and rafters in bad shape when re-roofing in the future. Otherwise basic structure is satisfactory.
FLOORS • Floors badly rotted by oil. Wearing surfaces needed replacement. Difficult to keep machines level once installed. Too much shimming necessary. New machine foundations needed in new locations. Stronger machine foundations needed.	Removed all concrete in areas where floors were in poor condition. Installed heavily reinforced ten-inch machinery slabs. Installed reinforced concrete floor, using vibration system to get an extremely dense concrete. Sealed floors to reduce absorption of oil.	Will repair or replace floors as subsequent departmental moves are made. Will also install new floors in outdoor area to be roofed over.
AISLES • Ridged and rough. Damaged by steel wheels on heavy trucks. Too narrow for traffic. Connecting aisles crooked.	All main aisles rebuilt. Steel grating welded to anchors set in heavy concrete aisle slab. Then aisle filled to floor level with pebble gravel cement. Troweled and surface-hardened to take both rubber-wheeled and steel-wheeled traffic. Straightened trucking aisles. Adjusted aisle levels between buildings with ramps.	Planned aisle repair completed.
SIDEWALLS AND SASH • Masonry weathered in some places. Steel sash rusted. Wood sash rotted. Foundation of one wall weakened.	Tuck-pointed masonry. Replaced steel sash with new steel sash, wood sash with new wood sash. Underpinned a 40-ft. portion of one wall. Reglazed where necessary.	Only routine maintenance now needed. Except that one 6000-sq. ft. metal building will be re-walled toward end of program.
ROOFS • Five-ply felt roof had been patched often. Dried out. Leaks frequent.	Replacing roof in sections with standard 5-ply felt, 20-year bonded roof. Adding copper flashing and downspouts. Pointing up coping stones. Painting escape ladders. Recaulking monitors. Reglazing monitors.	Work about four-fifths complete. Will complete as described.
PARTITIONS, INNER WALLS • Old wood-beaded partitions in former factory office areas.	Removed all non-functional partitions. Opened up areas to light.	Completed.
HEATING • Two major systems. Steam-heated hot water in 75% of plant. Hot air in 25%. Distributed through 38,000 feet of 1½-in. hot water pipe. Each of miscellaneous buildings had its own system.	Installing first group of overhead, rotary, low-pressure steam-heated unit heaters. They have two-speed fans. Each will heat 2200 square feet. Removing all hot water pipe.	Program 25% completed. Will convert in four easy stages.
LIGHTING • Low bays had filament lighting. High bays had shaded mercury and filament lighting. Plant had 20 units of general illumination. Circuits were loaded and badly situated for good economy and control.	**Low bays:** Replacing filament with fluorescent fixtures that cast 20% of light upward, 80% downward. **High bays:** Removing reflectors. Relamping with type H400 RCI, 400-watt mercury lamps and type R52, 750-watt reflector filament lamps. Combined, these cast about 20% of light up toward ceiling, 80% downward. General illumination level now approximately 50 units. Supplementary local lighting added where needed. Rewired and recircuited. Disconnects by departments.	Program approximately 20% complete. Will continue as described.
VENTILATION • Generally good, except in heat-treat department.	Added roof ventilators with powered fans in heat-treat department.	Completed.
ELECTRICAL SERVICES • Faced three major problems: (1) new equipment acquired with increased horsepower and additions to total equipment, (2) code infractions, (3) circuits loaded to capacity. Major revamping needed.	Kept 220-volt, 3-phase power because of cost of conversion. Put in first of four unit substations. Now have 750-kva., 220-volt, 3-phase for power. And 250-kva., 220/110-volt, 3-wire, single-phase for lighting. Will loop 1300-volt power and take off 220 by radial. Replacing open wiring with bus duct of 500-, 600-, and 1000-amp. capacity with conduit to machines. Also rescheduled loads to get even distribution among circuits and to get 25% growth capacity. Can add fans to transformers to get 33% increase in capacity.	Program well started. Much remains to be done as described. Eventually, when all new service equipment is in, power factor may be raised from 70 to 95. Depends on benefits from power rate in view of company's rate of operation.
OTHER PLANT SERVICES • (a) Compressed air capacity too low for needs. Cost of air too high at lower levels of production and during second shift. Also too much rust and moisture in air lines. (b) Method for loading coal to storage bin inadequate.	(a) Installed new 832-cfm. compressor for supplying equipment and blow-off hoses. Now have 832-cfm., 407-cfm., and 289-cfm. compressors to give us flexibility for maintenance and standby. Added aftercooler, oil separator, and receiver to cut rust and moisture. Should reduce maintenance of air lines and tools. (b) Added space to bunker 45 tons of coal for week-end use. Installed new conveyor for handling coal to silo. Speeds and simplifies coal handling.	Completed (a) and (b).

THE PATTERN OF PROGRESS

The Lodge & Shipley plant was erected in several sections, at many different times, beginning in 1899. The last major building was erected in 1918. The buildings, as you may have noticed in the aerial photo, are of several different designs and materials.

Each modernization job, therefore, called for careful planning. This

And we felt a good chunk of the most important projects could be finished by Jan. 1, 1954. So we set up a short-term plan to give us full advantage of the tax laws in effect and the generally rosy business picture.

And it worked. At present we're more than half-finished with our basic 10-year program—we completed our short-term program on schedule.

Future Planning Simple · Our program actually boils down to this: For each budget period our controller tells us how much we can spend on the modernization program. Then our two committees sit down and take a fresh look at where we stand at the moment, in terms of our 10-year target. The programing is worked out by committee discussion, compromise, and finally agreement.

CONDITION OF PLANT	HOW LODGE & SHIPLEY MODERNIZED	STILL TO BE DONE
CHIP DISPOSAL • Had old shed on site. Required employees to move barrow-loads of chips outdoors throughout winter. Slow. Messy. Cost of storing and handling high.	Installed two cinder-block heated rooms adjoining plant areas where chips are generated. Worker barrows chips through doorway into room. Dumps in collector tray. Tray is operated by electric hoist. When switched on, hoist dumps tray-load of chips into container. Loaded container removed by contractor's truck when electric rolling steel door is raised. Chips drain from container through floor-grating into sump. Oil is skimmed and sold. Waste water is sewered. One room for cast iron chips. Other for wet turnings.	Will install another such room near point of chip generation. Third room will be for cast iron chips.
WASHROOMS • Obsolete in design and construction. Too large; wasted plant floor space. Excessive maintenance required. Adequate cleaning almost impossible.	Erected two washrooms after razing old ones. New rooms require no special light, heat, or ventilation. Unique design eliminates ceilings and doors. They are simple structures built of hard-burned magnesium brick; impervious to almost anything and especially to grease, shop dirt, and urine. Can be steam-cleaned periodically to restore to original condition. Saved several hundred square feet of floor space. New administration building provides washrooms for all office employees.	Plan to erect complete shower-, locker- and washrooms, when present outdoor area is roofed over. Will also provide separate facilities for foremen.
PAINTING • Entire plant painted last in 1927. Heavy accumulation of dust and grease.	Repainted plant with our own crew over week-ends and at other times convenient to production schedule. First scraped and steam-cleaned structure and hanging equipment wherever possible. Then put on, by spray gun, a heavy coat of oil sealer and a light green second coat. Painted five-foot-high dado of heavy green floor enamel, which can be steam-cleaned. Painted electrical equipment vivid orange. Moving equipment, yellow. Fire equipment, red. Machinery, machine tool gray. Painted trim on building exteriors. Painted exteriors of wood frame buildings with aluminum undercoat and a color coat. Painted water tank, smoke stacks.	Will program future painting so it becomes part of normal maintenance procedure.
PARKING • Main lot at rear of plant in need of repair. It was poorly located for office employees. Also encouraged waste of space because of its hilly nature and layout.	Graded, paved, and fenced two lots for office employees and visitors, one at each end of administration building. Total capacity — 70 cars. Regraded and asphalt-treated two-level lot at rear of plant. Installed concrete stairs between levels. Capacity: 125 cars.	Modernization completed.
PLANT LAYOUT • More than a dozen manufacturing buildings on the site. Handling and flow tedious. Some departments wasted space. Others cramped. Departments not situated in proper relationship to one another.	On basis of consultant's survey and recommendations, are relocating all departments possible without moving heavy equipment. Straightened out flow. Reducing handling material — by at least 25%.	Will continue relocation of departments and operations according to master plan. Urgent move for near future will be relocation of crating and shipping departments in main factory building. Now in a separate small building.
PLANT SIZE • Aggregate floor space scattered in many small buildings. Problem was to pull it together, if possible; to convert it to efficient space without major building effort.	Recaptured 20,000 square feet by moving plant offices to administration building. Have centralized production activities when possible, relegating least important activities to outlying buildings.	Will roof over area 32 by 850 feet to rejoin two main factory buildings. Roof will be sawtooth truss, high bay. Oriented for north light. Trusses will be tied to existing columns. Thereby will gain considerable space at low cost. This will permit reduction in number of outbuildings needed and free site space for outdoor handling and storage.
COOLING WATER • Water for cooling air compressors and cutting oil is used once, then wasted. Water conservation now appears attractive as a cost cutter.	None.	Considering alternate methods for chilling and recirculating cooling water. May settle on a cooling tower.

table shows what L&S started with, what has been accomplished to date, and what still needs to be done before the end of its 10-year modernization program—in 1960.

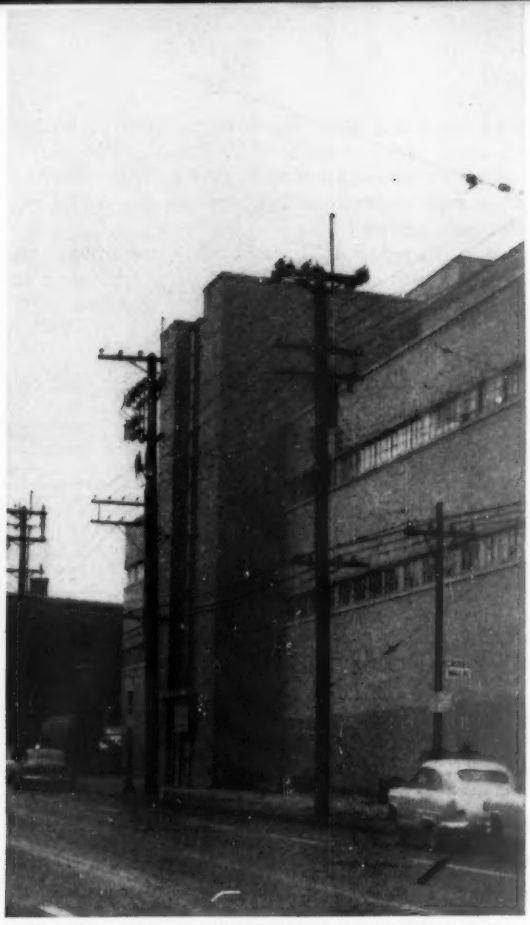
For results, turn the page

Begins on page A-12

HERE ARE SOME OF THE
RESULTS OF MODERNIZATION . . .

IN OFFICE AREAS

FIRST STEP WAS TO RAZE the old 2½-story office building. Company's administrative operations had far outgrown this building and had pushed out into factory areas. Studies indicated that remodeling this structure would be excessively costly.



EFFICIENT NEW ADMINISTRATION BUILDING is three stories high, with a penthouse on top. All employee facilities—cafeteria, personnel offices, employment reception, restrooms,

ULTRA-MODERN LOBBY WELCOMES visitors. Fish tank and brick planter box make interesting decoration. Green terrazzo floor is inlaid with white squares and aluminum divider strips. Blond woodwork is set off by green, chartreuse, grey-brown, rust, and white in walls and drapes.

IN TYPICAL OFFICE AREA new desks are well spaced in abundantly lighted room. Vision-strip windows can be curtained as shown. Floor is concrete, with rubber-base paint. All general and private offices are styled similarly, are air conditioned, have acoustical ceilings.

and medical rooms—and the lobby are on the windowless first floor. On the second floor (which because of sloping ground is about shop-floor level) are all factory office activities. Sales, accounting, etc., are on the third floor. The penthouse contains the executive dining room, a washroom and shower room, and office air conditioning equipment.

MEDICAL CENTER is adjacent to ground floor personnel and employment offices. It includes doctor's office, first aid room, a treatment room, and medical reception center. Walls are painted concrete block and glazed tile. Floors are asphalt tile. Lighting fixtures are the direct-indirect type.

AIR CONDITIONED CAFETERIA seats 178. Cooking and serving areas are behind partition at rear. At left center is dishwashing room. Music plays during four-period lunch hour.

More on the two pages following

Begins on page A-12

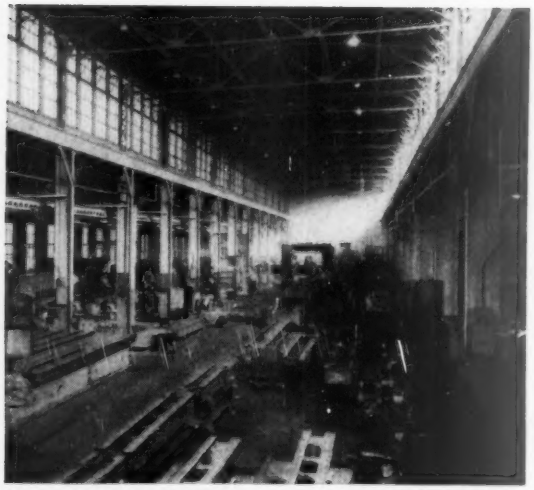
HERE ARE SOME OF THE RESULTS OF MODERNIZATION . . .

IN PRODUCTION AREAS

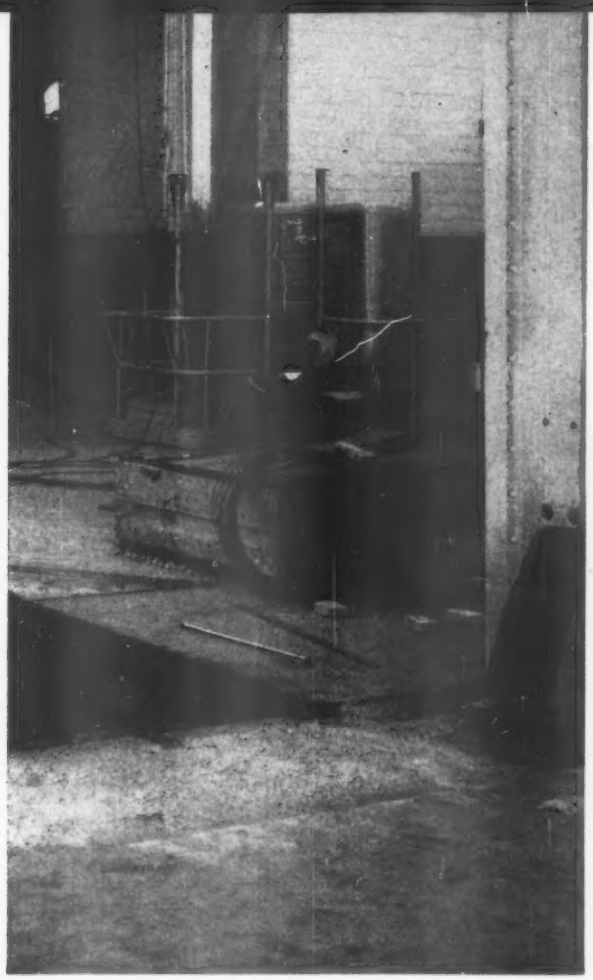
NEW UNIT HEATERS each heat 2200 square feet. Rotary, steam-heated units have individual thermostatic controls. One above opens when door at left is opened.

MAIN AISLES WERE REBUILT throughout the shop, since the original aisles were ridged and rough, too narrow for efficient traffic movement. The job was done by welding steel grating panels to anchors cast in the heavy concrete slabs. Then the

FACTORY AREA BEFORE MODERNIZATION was dark and dingy. All lighting was filament type. Wiring was in conduit. Plant was heated by inefficient central system.

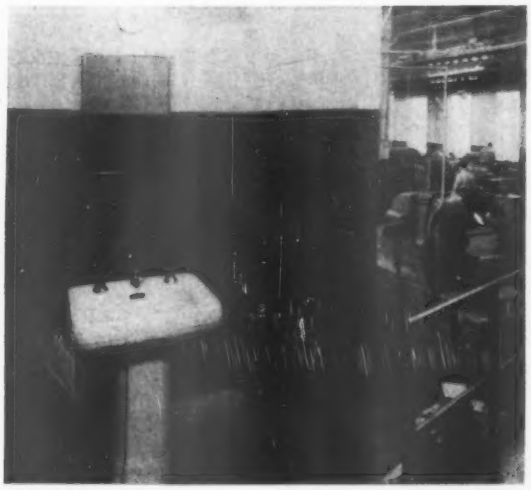


AFTER MODERNIZATION shop areas are bright and clean. Frame and walls are white with green trim. High-intensity reflector lamps light high bays; fluorescents light low bays.



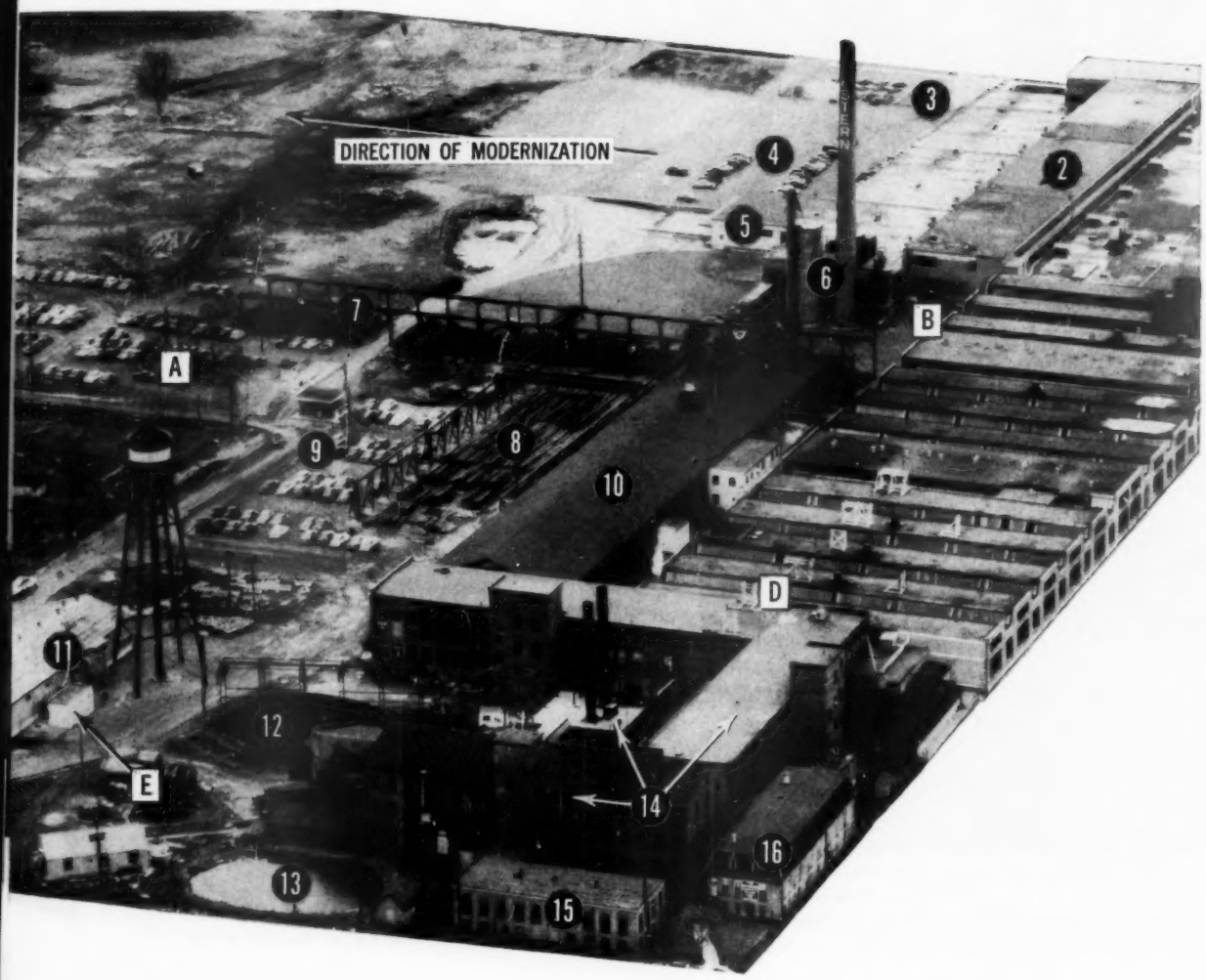
aisle was leveled to the floor with pebble-gravel cement, compacted to form a strong, armored aisle. Cement was troweled, and the surface hardened to withstand continual impact of steel-wheeled materials handling equipment.

TWO NEW CHIP DISPOSAL ROOMS adjoin plant area, one for cast iron, one for wet chips. Workman dumps chips in hopper, which is hoisted for dumping into container. Container is removed by contractor's truck when full. Oil drains into basin.



JIFFY WASHROOM between plant and administration building allows employees to clean up, if they want to, before entering offices. Room is small and open, convenient to use.

UNIQUE LAVATORY DESIGN eliminates doors, ceiling, additional lighting and ventilation equipment; cut cost to the bone. Hard-burned magnesium brick walls can be steam cleaned.



How They Modernized

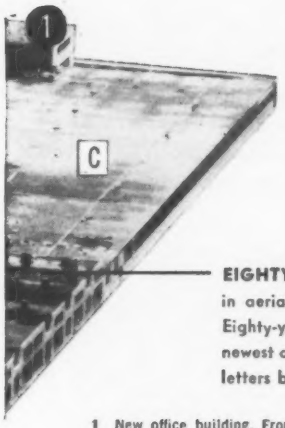
PLANT: Western Automatic Screw Machine Company, Elyria, Ohio

DESIGNER AND BUILDER: The H. K. Ferguson Company, Cleveland (of newest addition)

A bird's-eye view of Western Automatic Screw Machine Company would give you a picture of plant expansion by addition. You'd see Western's original brick-and-mortar, multi-story factory, built in 1873 and ultra-modern by then-current standards. And you'd spot subsequent additions, all modern for their times. Today every unit, from the first building to the latest addition, is in use.

Why are old buildings still needed? Despite efforts to provide for future needs, Western's production has outgrown facilities on several occasions. The company would put up a modern addition and start

A SIGNIFICANT TO GUIDE YOUR



EIGHTY YEARS OF DESIGN are shown in aerial view of Western Automatic plant. Eighty-year-old buildings are in foreground, newest addition at upper right. Numbers and letters below are keyed to photo.

1 New office building. Front and entrance of the plant were moved from one end of site to the other.
2 Service monitor on new plant – contains offices, cafeteria, locker room, washrooms, lavatories, and space to expand service facilities.
3 Visitors' parking area.
4 New employee parking area – fenced, paved, and lighted.
5 New receiving and shipping building – attached to new addition.
6 New boiler plant with 176-ft. stack and coal silo.
7 Craneway and steel storage yard – to be razed and replaced by new storage area.
8 New craneway and steel storage yard – to be extended toward foreground as shown.
9 Location of proposed new draw plant – guardhouse in center of site will be moved.
10 Present draw plant – to be modernized for bar- and screw-stock storage.
11 Butler standard building – sheathed in aluminum and erected two years ago for additional manufacturing space.
12 Coal storage yard and handling equipment – to be retained for additional coal storage.
13 Pond (100,000 gallons) and pump house – water supply for putting out fires. Primary storage is in nearby elevated water tower.
14 Pre-1900 buildings, including old boiler house – to be razed.
15 Old office building – to be razed or modernized.
16 Old office building – to be razed.

A Main substation – moved to this site out of path of future plant expansion.
B Outdoor 1500-kva substation for part of 1936-47 buildings.
C Indoor 1500-kva. load center for new plant.
D Outdoor 1000-kva. substation (out of view in alley) for remainder of 1936-47 buildings.
E Outdoor 500-kva. substation for adjacent building and pre-1900 buildings.

by Addition

vacating the oldest and least efficient buildings. Then an upturn in business would demand more production, so machinery and equipment would be moved back into the old buildings. Now Western's executives hope their newest $2½-million addition will solve their perennial problem once and for all.

They expand, then modernize · Each time Western has grown, it has first added a new structure, then brought the older existing plant as far as possible up to current standards. The company has never tried (or even wanted) to match a new addition to the existing plant in terms of design, utilities, or service equipment. In fact, quite the opposite is true, at least to the extent dictated by good judgment.

To show you what we mean, we've prepared a table (next page) reviewing plant features for three eras of construction at Western. Except for certain miscellaneous buildings, the table includes the oldest group of buildings erected between 1873 and 1900, the second group of three buildings (actually they look like one) built between 1936 and 1947, and the newest addition occupied in 1953.

Why expand by addition? Western Automatic has seven good reasons.

1) Some early company executive had the foresight to acquire 40 acres for future expansion. Actually the site was far larger than needed in the foreseeable future.

2) Management foresaw the advantage of advance planning, and called for an over-all plan to blueprint future growth. The plan, when developed, provided the company with a broad pattern for best site utilization.

3) Western has always been well located for serving its market—principally companies in the Midwest.

4) Many employees have been with the company a long time. And most shop workers are skilled operators of precision tools.

5) Technological changes in the manufacture of screw machine products are neither frequent nor on a large scale. So Western has had no comprehensive process changes warranting a move to another site.

6) The older buildings made fair storage and office areas. Not the best, but good enough not to be replaced by new space at high first cost.

7) All of the buildings erected since 1936 are extensive and reasonably modern. The cost of replacing them now would doubtless far exceed the value of any extra benefits derived. Moreover, these buildings were planned to accommodate plant additions.

Table of construction features and illustrations on following pages

FEATURE	1953 ADDITION	1936-47 ADDITIONS	PRE-1900 BUILDINGS
Number of stories	One story with service and office monitor.	One story, with service monitor for locker and washrooms.	Three stories and basement.
Type of structure	Steel I-beam girders, 8 x 8-in. steel columns, channel purlins.	Steel frame with 10 x 10-in. H-columns, monitor trusses.	Timber, 12 x 12-in. beams on 8-ft. centers. Wood posts. Some supplementary pipe columns.
Floor construction	Concrete slab, 8-in. reinforced. Two-inch wood block on slab.	Reinforced concrete, 10-in. slab.	Two plies of 2 x 6-in. lumber, surfaced with 1 x 3-in. maple flooring.
Sidewall construction	One course of 4-in. concrete block. Outer course of red face brick. South wall all block for expansion. Curtain wall design.	Three courses solid masonry. Sheet iron end walls for expansion.	Solid masonry pilaster construction, 3 courses.
Roof construction	Steel deck. One-inch fibrous glass insulation. Three-ply felt. Tar and gravel. Roof flat to hold 1½ inches of water for supplementary insulation.	Monitor with sash both sides. Precast concrete deck. No insulation in one section. Insulation cast in slabs in other two sections.	Wood. Three-ply felt.
Bay size	25 x 31 feet.	25 x 63 feet.	8 x 16 feet.
Ceiling height	15 feet to lowest steel.	15 feet in low bays. 20 feet under monitors.	12 feet.
Floor capacity	Actual unknown but designed for any possible future need. Column and wall footings on bedrock. Slab poured on 30-in. sand fill.	Actual unknown. Slab poured directly on natural rock.	Actual unknown. Floors heavily shored and supported by supplementary columns. Using 150 lb. per sq. ft. for current loading.
Heating	Plant: Ceiling-mounted space heaters. Fresh-air modulating dampers. Operate on steam. Thermostat-controlled. Office: Hot water. Tempered forced air.	Steam-fed, ceiling mounted unit heaters.	Original uncertain. Later installed 1½-in. diameter steam pipes along walls.
Lighting	Plant: Fluorescent in continuous rows with 35 units of light maintained. Office: Fluorescent, 85 to 100 units of light maintained.	Natural light through monitors. Supplementary lighting from 2-tube, 40-watt fluorescent fixtures at machines.	Earliest—oil. Later—filament lighting of low intensity.
Ventilation	Fresh air induced through heaters in heating season, through windows in warm weather. Forced exhaust.	Natural through monitors and sidewall sash.	Natural through windows.
Water supply	City water.	City water.	From wells.
Power supply	Comes to main substation at 24,000 volts. Power center (5000 kva.) cuts it from 2300 to 440 volts, 3-phase. Radial distribution. Individual lighting transformers.	Comes to main substation at 24,000 volts. Reduced to 2300 volts there and to 440/220 volts, 3-phase, at two secondary substations, one 1500-kva., another 1000-kva.	Steam. Then natural gas engine. Then steam-electric. Later purchased power. Line shafting and belt drives for machinery. Now, fed from 500-kva. sub at 220 volts, 3-phase, and 110 volts, single-phase.
Power distribution	All bus duct. Lighting through conduit.	Power through bus. Lighting through conduit.	Open cable. Later, everything in conduit.
Sanitary facilities	All modern. City sewage. Tile rooms	All modern. City sewage.	Outdoor privies at start. Later built lavatories into elevator wells.
Sash	All steel.	All steel.	Wood drop sash. Some steel later.
Cost	Plant area, 180,000 sq. ft. Approximate cost, $11 a sq. ft. Office area, 28,000 sq. ft.	Cost under $10 a sq. ft. High then.	Unknown.

PLANT FEATURES for three construction eras at Western Automatic are reviewed above. Table covers oldest buildings erected between 1873 and 1900, second group built between 1936 and 1947, and newest addition occupied in 1953.

1900 Small bays, low ceilings typify pre-1900 buildings, which Western hopes to raze in the near future.

1936 Big bays, high ceilings typify 1936-47 plants. Roof monitors provide plenty of natural light.

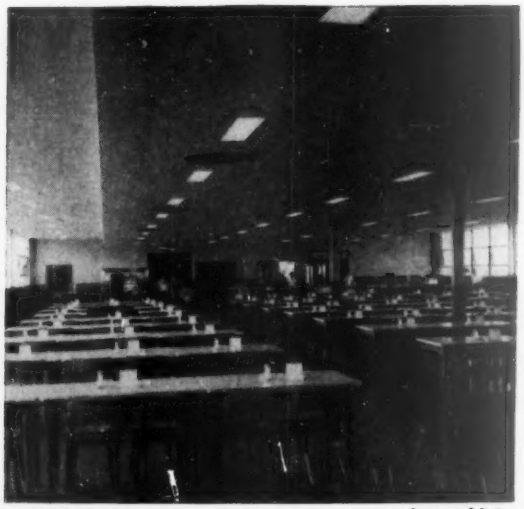
1953 New factory areas are well lighted by runs of fluorescent troffer units. Fresh air comes from windows in warm weather, from ceiling-mounted unit heaters in cold weather. Roof exhaust fans vent plant.

More on next page

MAIN ENTRANCE of Western's plant is this new two-story office building of white Indiana limestone. Bottom rows of window panels are clear glass. Others are blue frosted pebble glass to reduce glare. Door at extreme right leads to personnel department, is used by job applicants. Parking lots, not shown in photo, are farther to right.

NEW LOBBY is half inside and half outside of office building. Glass front is set off by modular aluminum sash. Sidewalls are red Roman brick (1⅝x12

OFFICE AREA on second floor houses accounting and payroll departments. Ceiling is white, perforated, cellulose-fiber tile—conceals ventilating ducts. Floor is mottled-green asphalt tile. Walls are light green. South and west windows have tinted glass. Movable partitions enclose private offices.



CAFETERIA in service monitor atop newest plant addition seats 320 persons. Food is prepared and served at far end. Acoustical tile ceiling helps to hold down noise. Recessed fluorescent units augment natural lighting. Ventilation is natural and forced. Upper walls are painted dusty rose; dado is Swedish red. Floor is mottled-gray, greaseproof tile, has black cove strip where it meets walls.

inches) in recessed white mortar. Rear wall is hand-rubbed red birch. Back-lighted company sign and roof trim are aluminum. Lobby contains receptionist's desk, telephone switchboard, public phone, lavatory, and product display case.

CONNECTING RAMP links Western's newest building with one erected in 1947. Western says this method of connecting the two additions saved heavy excavation costs. Ramp's slight slope is no handicap to pedestrian or truck traffic.

NEW BOILER HOUSE—with coal-storage silo, elevating conveyor, and 176-ft. stack—adjoins latest plant addition. It has two stoker-fed, water-tube boilers. And room for two more when they're needed. Old boiler house will be torn down.

ALUMINUM SHEATH covers steel-framed building. Building was erected two years ago to house miscellaneous manufacturing operations. Western says it has turned out to be a good, maintenance-free investment.

For an outline of the construction problems involved, turn the page

Problems involved • Expanding by addition is no path of roses, as Western's engineers will tell you. When the most recent expansion was planned, problems popped up right and left. One was the need for larger parking areas. Another was relocation of the rather ancient main entrance. Still another was distributing power in the new plant and coordinating it with electrical services in the older plant. Here's how these problems and a few others were solved.

New boiler house. The old one, adjoining the oldest section of the plant, just didn't have the capacity to carry both the old and new plants. The new boiler house, next to the new plant addition, contains two 25,000-lb.-per-hr. water tube boilers with underfed stokers. A 400-ton coal silo and a pneumatic ash handling system were also added.

The new brick stack, 176 feet high, provides natural draft and eliminates a fly-ash problem which previously was a neighborhood sore point. The stack and breeching are sized to accommodate two additional boilers when necessary.

Coal-fired boilers were selected although they and their supplementary equipment cost 25% more than gas- or oil-fired equipment. Why this choice? Because careful study showed that in Western's location coal was the best bet from an operating-cost standpoint. What's more, an existing 2000-ton coal-storage area with coal-handling equipment can be utilized with coal-fired boilers.

The old boiler house was abandoned—for razing.

Changes in condensate lines. With the new boiler house at the opposite end of the site from the old one, condensate lines drained the wrong way.

Western had to run a new high-pressure steam line from the new boiler house to the old multi-story building, then bring condensate back uphill, with aid of a pump in the basement of the old boiler house. Condensate lines in the single-story buildings (1936-47) were then re-pitched to the new boiler house with relative ease.

Power distribution. Rather than try to tie the new power distribution system into the old one, Western found it smart to keep the systems independent. Hence the new addition has its own power center.

Western solved the problem by setting up four main circuits. All are fed from the plant's main substation, which had to be moved to make way for the new addition and for future buildings.

For the newest addition, power is fed at 2300 volts from the main substation to the new indoor 1500-kva. load center. There it is reduced to 440 volts, 3-phase. Individual lighting transformers spotted around the plant cut it to 110 volts.

For the 1947 building, power is fed at 2300 volts to a 1500-kva. outdoor substation, where it is reduced to 440/220 volts, 3-phase.

For the 1936 building, power is fed to another 1000-kva. outdoor sub at 2300 volts and there reduced to 440/220 volts 3-phase.

For the oldest buildings and for some miscellaneous buildings, power is fed to a small 500-kva. outdoor sub at 2300 volts, then reduced to 110 volts, single-phase.

Office relocation. Formerly offices were scattered throughout the oldest buildings. Now they are centralized in the new addition.

New main entrance. The old main entrance and lobby—in the oldest end of the plant—were outmoded. The latest expansion offered Western its chance to move the main entrance to the new addition, and to give it a modern facade of glass, aluminum, and brick.

New employee facilities. Western's executives had known for some years of the need for more and better employee facilities. But, instead of tackling these improvements independently, they worked them into the over-all expanison program. And they came up with . . .

. . . a new 320-seat, $75,000 cafeteria. Faster service gives shop employees more time to eat, lets office personnel shorten their lunch period and thus work 30 minutes earlier.

. . . a new and larger first-aid and medical center that's located in the heart of the plant rather than at one end as before.

. . . new locker, shower, and rest rooms to serve the increased number of employees resulting from the expansion. These facilities are located in the new plant's roof-monitor section.

. . . a new personnel center and employment office with a separate entrance at the front of the plant, a waiting room, testing room, physical examination room, service counter, records storage area, and plenty of desk space.

And many other changes. Expansion by addition isn't simply a matter of adding space and filling it. Western's program was engineered to improve manufacturing efficiency. So before even the size of the addition was known, company engineers were producing layout drawings, traffic density analyses, and flow-pattern frequency charts to learn how much production space was needed and how it would be assigned. Result: Expansion gave Western its opportunity to . . .

. . . relocate the bar storage yard and crane, factory offices, ignitron and electrical controls, machine shop, die room of the draw plant, and main substation.

. . . centralize all factory service and maintenance activities. New water, sanitary, and sewer lines were laid.

. . . build new parking lots or enlarge, fence, and light old ones.

. . . speed shipping of products and receiving of materials by creating new shipping, receiving, and finished-stock storage areas.

BUILDINGS and GROUNDS

IN

195X PLANT

SECTION B—INDEX

Two basic tools for 195X planning ...

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... plus one case in modernization for 195X

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Albany Felt Company

... and three significant new plants for 195X

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Worthington Corporation

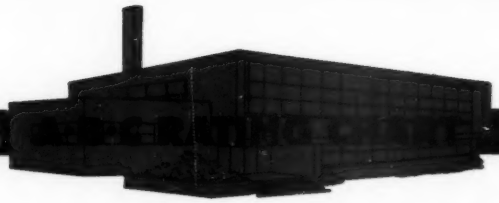
Good-Looking, Flexible, Expandable B-18
The Cyril Bath Company

Best-Looking Plant of the Year? B-20
The Parker Pen Company

New Free Catalogs B-28

B

FACTORY's [illegible] FOR BUILDINGS



INSTRUCTIONS. Rate *A* for excellent, *B* for fair, *C* for poor. Skip squares if items or headings are not applicable. A row of *A*'s means you're in good shape. A row of *B*'s and *C*'s points to the need for action.

	DO YOUR RATING IN THESE COLUMNS . . .						CHECK ACTION HERE . . .				
							WHAT			WHEN	
	PHYSICAL CONDITION	CAPACITY FOR PRESENT NEEDS	CAPACITY FOR NEXT YEAR	CAPACITY FOR 195X	MAINTENANCE COSTS	OUTLOOK FOR LONG SERVICE	REPAIR	REPLACE	ADD NEW	NOW	LATER
[illegible] MARKING →	A	C	B	B	B	C		✓		✓	
PLANT SITE											
1 • Space for plant operations											
2 • Space for yard operations											
3 • Space on site for expansion											
4 • Outdoor storage areas											
5 • Rail spur and siding											
6 • Site fencing											
7 • Drainage											
8 • Ground water level affecting basements, pits, underground tanks, tunnels											
9 • Ground levels in relation to manufacturing floors for materials flow											
10 • Landscaping, floral beds, trees											
11 • Recreation areas											
VEHICULAR TRAFFIC											
1 • Vehicular traffic flow near plant											
2 • Access roads to plant											
3 • Employee parking areas											
4 • Truck parking areas											
5 • Truck maneuvering areas											
6 • Receiving facilities											
7 • Shipping facilities											
8 • Traffic markers and signals											
9 • Curbs											
ROOF-MOUNTED STRUCTURES											
1 • Skylights											
2 • Monitors											
3 • Stacks											
4 • Vents											
5 • Ventilators											
6 • Cyclones, dust control, and fume control equipment											
7 • Water tanks											
8 • Cooling tower											
9 • Signs											
10 • Penthouses											
11 • Walkways											
12 • Lighting Equipment											

AND GROUNDS . . . TO GUIDE YOUR 195X PLANNING

	DO YOUR RATING IN THESE COLUMNS . . .						CHECK ACTION HERE . . .				
							WHAT			WHEN	
	PHYSICAL CONDITION	CAPACITY FOR PRESENT NEEDS	CAPACITY FOR NEXT YEAR	CAPACITY FOR 195X	MAINTENANCE COSTS	OUTLOOK FOR LONG SERVICE	REPAIR	REPLACE	ADD NEW	NOW	LATER
ROOF											
1 • Roof covering											
2 • Flashing											
3 • Expansion joints											
4 • Insulation											
5 • Roof deck											
6 • Gutters and downspouts											
SIDEWALLS											
1 • Exterior walls											
2 • Windows											
3 • Sash											
4 • Insulation											
5 • Coping											
6 • Parapet walls											
7 • Sills and lintels											
8 • Doors for materials entry and departure											
9 • Doors for employee entry and exit											
10 • Main entrance											
PLATFORMS											
1 • Floors											
2 • Framing											
3 • Roofing											
4 • Floor space on platforms											
FOUNDATION											
1 • Foundation walls											
2 • Piers											
3 • Backfilling											
4 • Foundations for heavy equipment											
FLOORS											
1 • Floor load capacity											
2 • Aisle load capacity											
3 • Joists											
4 • Bridging											
5 • Floor surfaces											
6 • Aisle surfaces											
7 • Aisle width											
8 • Floor levels at truck and rail docks											

Turn the page

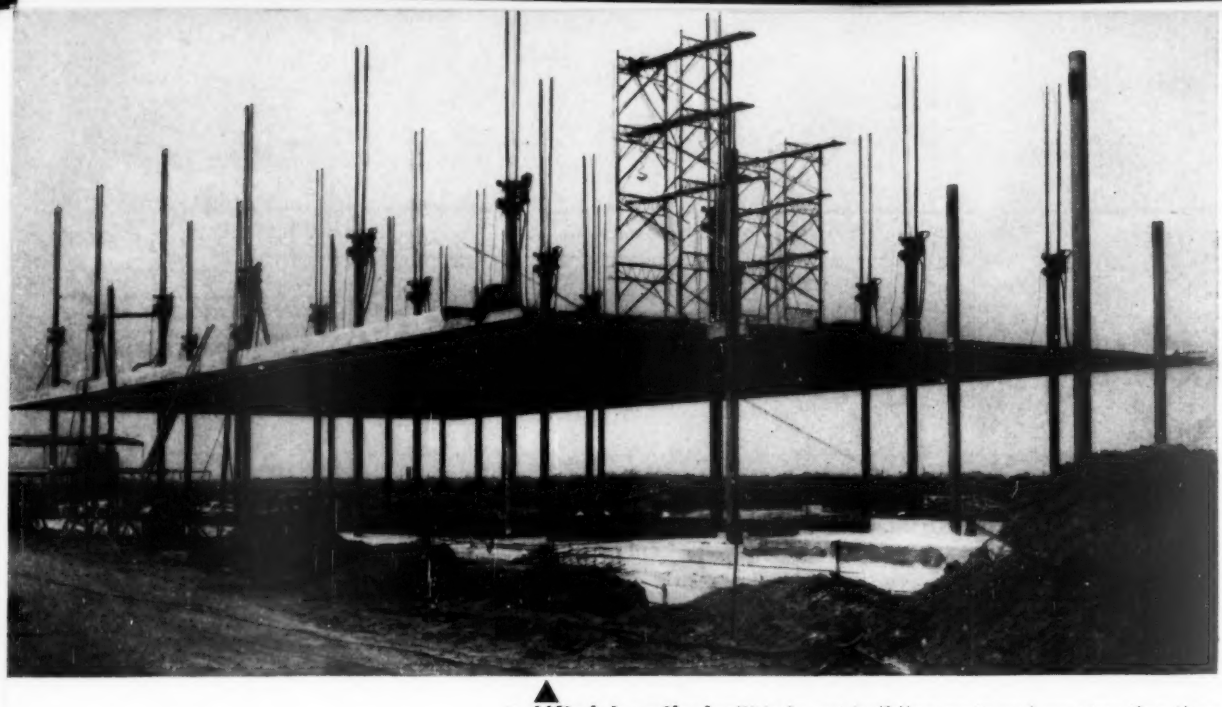
B

A-B-C RATING CHART FOR BUILDINGS AND GROUNDS . . . *Begins on page B-2*

INSTRUCTIONS. Rate A for excellent, B for fair, C for poor. Skip squares if items or headings are not applicable. A row of A's means you're in good shape. A row of B's and C's points to the need for action.

	DO YOUR RATING IN THESE COLUMNS . . .						CHECK ACTION HERE . . .				
							WHAT			WHEN	
	PHYSICAL CONDITION	CAPACITY FOR PRESENT NEEDS	CAPACITY FOR NEXT YEAR	CAPACITY FOR 195X	MAINTENANCE COSTS	OUTLOOK FOR LONG SERVICE	REPAIR	REPLACE	ADD NEW	NOW	LATER
CANOPIES											
1 • Roofing											
2 • Framing											
PLANT STRUCTURE											
1 • Span length											
2 • Ceiling height											
3 • Columns											
Steel											
Concrete											
Wood											
4 • Ease of making layout changes											
5 • Fitness for installing auxiliary equipment within the plant											
6 • Fitness for installing equipment on the roof											
7 • Beams and purlins											
AREAS WITHIN PLANT											
1 • Lobby and entrance											
2 • Corridors—office											
3 • Partitions—office											
4 • Office space											
5 • Storage areas											
Raw stock											
In-process inventory											
Finished inventory											
Miscellaneous											
Supplies											
6 • Ease of making layout changes											
7 • Rail siding inside plant											
8 • Receiving dock space											
9 • Receiving dock handling equipment											
10 • Shipping dock space											
11 • Shipping dock handling equipment											
12 • Production offices											
13 • Supervisory offices											
INTERIOR SURFACES											
1 • Interior walls											
2 • Ceilings											
3 • Partitions											
4 • Doors											

	DO YOUR RATING IN THESE COLUMNS . . .						CHECK ACTION HERE . . .				
							WHAT			WHEN	
	PHYSICAL CONDITION	CAPACITY FOR PRESENT NEEDS	CAPACITY FOR NEXT YEAR	CAPACITY FOR 195X	MAINTENANCE COSTS	OUTLOOK FOR LONG SERVICE	REPAIR	REPLACE	ADD NEW	NOW	LATER
5 • Fire doors											
6 • Stairways											
7 • Elevator shafts											
8 • Ventilation shafts											
9 • Utilities shafts											
10 • Walls in sanitary areas											
11 • Fire walls											
INTERIOR EQUIPMENT											
1 • Elevators											
2 • Guardrails											
3 • Catwalks											
4 • Mezzanines											
5 • Attached handling equipment											
YARD EQUIPMENT AND STRUCTURES											
1 • Pavements and driveways											
2 • Walks											
3 • Small auxiliary buildings											
4 • Water tanks or standpipe											
5 • Hydrants											
6 • Sewers											
7 • Tunnels											
8 • Bridges											
9 • Overhead pipelines											
10 • Fixed materials handling equipment											
11 • Railroad tracks, accessories											
12 • Platform scales											
13 • Gatehouse											
14 • Signs											
15 • Stairs											
16 • Guardrails											
17 • Flag pole											
18 • Guard walls											
19 • Miscellaneous tanks											
20 • Incinerator											
21 • Yard lighting equipment											
22 • Yard fire protection equipment											
23 • Outdoor paging equipment											
24 • Guard towers											
25 • Fire escapes											
26 • Chimneys											



59 Ways to Improve Buildings and Grounds for 195X

By R. A. DILLEY
Associate Editor
FACTORY

1 **Lift-slab method** will help cut building costs and construction time at Cherry Hill, (N. J.) laboratory and office project of the Radio Corp. of America, now in progress. Shown above is a 300,000-lb. roof slab being lifted by hydraulic jacks from the ground level. A control console regulates the rate of lift, and enables the engineer to keep the slab level. Construction begins with erection of steel columns on concrete footings. After reinforcing steel, underground conduits, and ducts have been placed, concrete foundations and ground floor slab are poured. On top of this slab are poured the floor slabs for second and third stories and for roof. A special coating is painted on each top surface to keep slabs from sticking to each other. Each slab is cast with a special cast-steel lifting collar that fits around each column. After all slabs have been poured in a stack and allowed to cure, the lifting process begins. Atop each supporting column is a special hydraulic jack, with hose connections to control panel and to a 2000-psi. source of pressure. Suspended from each jack are two long threaded steel rods that are fastened to the lifting collar of the slab. As the slab is raised in 3-in. strokes, two holding nuts are run down and reset for the next stroke. When the slab is in the final position, steel lugs are welded to each column under the lift collar to hold the slab in place.

2 **Island office houses supervisors** at Hall Printing Co., Chicago. Walls are Hauserman movable steel panels. Roof is steel decking. Wiring can be poked through where needed. Curb protects structure from vehicles. Office can be disassembled and moved to a new location in a few hours.

3 **Wall painting improved appearance,** and protects masonry at Cadillac-Cleveland Tank Plant. A survey showed mortar joints were breaking up. Cadillac solved the problem by contracting for a rubber-base, alkali-resistant paint. First the contractor sandblasted the walls and mortared all cracks. Then he applied Cementhide (Pittsburgh Plate Glass Co.) with deep-nap rollers. This method was deemed superior to brushing (a more uniform coating), and to spraying (because of possible damage to other buildings and employees' autos). Expected life, 4 to 5 years. It took 5000 gallons of the pore-sealing paint to cover 450,000 square feet of wall surface. The cost: $36,500.

4 **Stainless-steel sheathing** helped Heppenstall Co. steer clear of a patched-up appearance when it converted two old-fashioned office buildings into this modern one in Pittsburgh. A story was added to one of the old structures, and a new unit was erected in a courtyard. Then the windows were sealed and the walls sheathed with 18-page, fluted, stainless-steel panels that resist stain and are easy to clean. The base trim is granite-like terra cotta tile.

5 **For roof cooling,** try a roof spray or roof pond. The roof on the new plant for Western Automatic Machine Screw Co., Elyria, Ohio (page A-20), was designed to hold 1½ inches of water. Rain collects, and cools as it evaporates. For a new roof consider the pond. For an existing roof, the spray. But consult a good roofing contractor before using either.

6 **Be a good neighbor** is good advice at any time. It's specially good for the company that's planning its buildings and grounds with 195X in mind. Good example of "how to do it" is the new warehouse of Tube Distributors, Inc., at Garden City, N. Y.—one of the better suburban communities on Long Island. It's a good-looking, well-landscaped job that would be looked on with favor by any group of civic-minded citizens. As for benefits to the company, they are the ones that go naturally with consolidation of operations in six warehouses.

7 **Fire insurance costs** were cut 85.8% at Templeton, Kenly & Co., Broadview, Ill., by isolating hazardous areas — such as spray painting — from the rest of the plant by fire walls and fire doors. Premium cut makes a tidy annual saving for Templeton-Kenly.

8 **Insulating windows** like this one in the new Alcoa headquarters building in Pittsburgh are quickly and easily installed. Why? Because their extruded aluminum frames were installed at the site before the aluminum curtain wall panels were erected. Sealed double-glass windows were slipped in — from inside the building—after the curtain wall panels had been set in place.

9 **Same windows** are pivoted for easy cleaning. They're locked in frames but can be quickly opened with a special tool. Cleaner pivots window to wash inside and outside. Window edge is equipped with a butyl rubber gasket which the cleaner inflates to 30-lb. pressure when he's through. Seal withstands 80-mile winds and driving rains.

10 **Automatic doors** at Pure Milk Co., Akron, speed up handling, cut down loss of conditioned air, keep storage temperatures constant. Stanley Magic Door operators are available in swinging, sliding, and folding doors. They're powered by compressed air—can be controlled by photo cells, pullcords, pushbuttons, or floor plates.

11 **Picking the right location** is no small problem for 195X planners. The Cleveland plant of National Sugar Refining Co. is the country's first sugar packaging plant and warehouse to be located inland. National picked this site for speedier distribution to the Midwest. Surrounded by big steel mills and near a refinery, the plant is exposed to heavily polluted air. To offset this condition, The Austin Co., which designed and built the plant, used aluminum siding for upper walls. Lower walls and office

section are brick. Glazed tile was used for interior walls for extra cleanliness. Plant is completely air-conditioned to protect the process and to increase employee comfort.

12 **New administration building** is one of Ford Motor Co.'s many current company modernization and expansion projects. The 12-story building will be erected on a 120-acre site in Dearborn, Mich. It will be air-conditioned throughout. It will have movable interior partitions to provide maximum flexibility of floor arrangements. An attached three-story structure will contain employee cafeteria and dining rooms, a garage, mail-room, and other similar facilities.

13 **Want textured walls and ceilings?** Then try Spred Texture, a new Glidden Co. material. Use on any inside wall or ceiling surface — dry wall, plaster, plaster board, masonry, or block. Texture with sponge, hand towel, paint roller, or whisk broom.

14 **Protect masonry walls** with silicone-base water-proofing compounds. One plant engineer says he's used such materials over a four-year period. Masonry is kept drier, more attractive, cleaner. And efflorescence has been reduced. But, he adds, be sure your windows are protected when the material is sprayed on. He made the mistake of not protecting his, paid cleaners a fortune to get the stuff off the glass. These compounds can be brushed on, too.

15 **DuraDor's your door** if you're looking for one to take real abuse. American Hard Rubber Co., New York 13, designed it to withstand assaults by fork trucks and other powered equipment. DuraDor is heavy-hinged, contains a shatter-proof window. It's made of plywood, armored with sheet steel, and given a tough hide of soft rubber. It won't splinter, sag, bend, or warp. Good also for corrosive atmospheres.

16 **Covered parking for visitors' cars** builds goodwill for Bert Mills Corp. at its new St. Charles, Ill., plant. Five-car port has flat roof supported on pipe columns. Roof also protects visitors as they walk to plant's rear entrance.

17 **Blow-out windows** of extruded Tenite butyrate plastic have been installed by Emery Industries, Cincinnati, in a building housing a process that uses hydrogen. In an explosion, panes are flexible enough to bow and pull away from the sash before walls or sash can be damaged. General Plastics Co., Marion, Ind., makes the new panes. But check with your fire insurance company, local codes, and plastic manufacturers before using plastic panes. You'll want to be sure they'll give way when water from a fire hose hits them. It's a case of using the right glazing method.

18 **Cut window glare** at low cost with Thermoglare film. Can be sprayed on for about 7 cents a square foot. Said to cut solar heat by 80% and glare by 95%. Reduces glass breakage; trims air conditioning and fuel costs; seals wood and brick against vapors; resists weather and chemicals; lasts for years. Also available as a solid plastic sheet in two standard thicknesses, for reglazing. Two colors, blue-green and frost white. Write Eastern Industrial Service, Inc., Washington 9, D. C., for technical data sheet.

19 **Plastic-finished wall panels** update Williamson Candy Co. plant at Indianapolis. Called Marlite, these panels are made by Marsh Wall Products, Inc., Dover, Ohio. They come as sections 16 inches wide and 8 feet long, or as blocks, 16 inches square. Both are 3/16 inch thick. From ten colors, Williamson chose blue and ivory. Also available in four wood patterns for offices. Permanent soilproof surfaces resist moisture, heat, and stains. No painting. Tongue and groove panels can be applied over furring strips by nails or clips.

20 **Mezzanine storage area** added 7480 square feet to Templeton, Kenly & Co. plant at Broadview, Ill. Decking mounted on steel joists fastened to columns does the trick. Central location in the plant permits loading in-process parts on one side of mezzanine, and removal from the other side for painting and shipping. Fork truck makes job easy.

21 **Vinyl partition material** is being readied for the market by B. F. Goodrich Co., Akron. Won't chip, dent, or need painting. Color is processed in the material when it is made.

22 **Porcelain-enameled, corrugated steel** may be the remedy if corrosive fumes are giving your roof a hard time. One company, facing this problem with a painted galvanized roof, replaced it with V-CORR sheets supplied by Toledo Porcelain Enamel Products Co. The 100-ft.-sq. sheets are available in gages from 18 to 24. The maker says a building's enameled parts will outlast its structural steel.

23 **Other porcelain-enameled materials** are used to face interior partitions and exterior decorative panels. The interior steel partitions are porcelain-enameled on both sides, have a

laminated gypsum core, and measure 24x120x2 inches. Their advantages include speedy, low-cost installation. The exterior panels have a porcelain-enameled steel front surface and a zinc-coated steel or aluminum back surface. They're plywood cored and come in 3x10x¼-in. sizes. Both kinds of panels are made by U. S. Plywood Corp., New York 36.

24 **Standard factory buildings** may be for you if you have to add space quickly. They're available with pitched or flat roofs; skylights; skins of aluminum, galvanized metal, corrugated asbestos, or asphalt coated metal. And don't think you can't have long spans of column-free space. Caterpillar Tractor Co. has 80-ft. spans in its new 160 x 160-ft. steel-frame building at Joliet, Ill. Building was manufactured by Luria Engineering Co., Bethlehem, Pa.

25 **Glasfab added 10 years** to the life of a 10-year-old roof at Cadillac-Cleveland Tank Plant. The roof is now guaranteed for another 10 years without recoating. Glasfab is an open-mesh, rot-proof glass fabric made by Twinsburg-Miller Corp., Twinsburg, Ohio. The Cadillac job was a big one—986,100 square feet (or 9861 squares). Cost ran about $11.40 per square. It included priming and conditioning the exposed areas, and application of Glasfab.

26 **Tinted glass cuts heat and glare.** You have it in your auto—now put it in your plant. It's available in a variety of finishes and strengths, smooth or pebbled. Replace brittle old glass in east, west, and south exposures. In skylights, too. Do it all at once or keep a supply on hand for gradual replacement.

27 **Mastic glazing compounds** offer real advantages over traditional putties. But make sure the compound you use is stiff enough to retain the glass properly. Some plant maintenance superintendents have told us the mastic they used was too flexible and allowed panes to fall out of operable sash.

28 **Protect your roof with glass-fiber mat.** Addex Roof Shield is said to provide a durable, weathertight surface that won't blister or alligator. Here's how it's applied. A cold asphaltic compound is sprayed on the roof and brushed level. Then the glass-fiber mat is rolled out, and more compound is brushed into it. Labco, Inc., Cleveland 6.

29 **For a skylighting area** of 4025 square feet, the Henry Miller Spring Mfg. Co., Pittsburgh, used Resolite. This is a translucent polyester-resin sheet material reinforced with glass fiber. The Resolite Corp., Zelienople, Pa., offers it in corrugated and flat sheets. Lengths up to 12 feet. Width, 29 inches. Comes semi-clear, pale green, ice blue. Seven colors available on special order.

30 **Another new skylight material** is Toplite (Kimble Glass Co., Toledo). Its prisms keep out most of the sun's hot rays in summer when the sun is high, let in the sun's rays in winter. Toplite comes in three sizes: 3x3, 3x6, and 4x4 feet.

31 **Domelite** is still another skylight you'll want to investigate. It's made of clear Plexiglas, which absorbs ultraviolet rays, and in translucent Plexiglas, which diffuses light, reflects infra-red rays. E. Van Noorden Co., Boston.

32 **Fire-retardant paints** swell and char on contact wth flame or excessive heat. And provide an insulating blanket of non-combustible ash over the affected area. In a recent test of one such paint, Ford Motor Co. found one coat kept the temperature of the material it coated as much as 350 F. below temperatures of similar unprotected materials. Be sure the paint you select is approved by Underwriters' Laboratories, Inc.

33 **A lightweight fireproofing material** gave Aluminum Co. of America a 4-hour fire-rated wall at its new 30-story Pittsburgh headquarters. The building was first faced with aluminum panels. Then slotted aluminum lath and reinforcing bars were placed. Finally a plaster wall was built up by air-spraying onto the lath four 1-in. layers of lightweight Perlite concrete. Windows were masked before spraying began. Advantages: excellent thermal insulation, good resistance to fire and sound transmission, light weight (35 pounds per square foot against as much as 150 pounds for comparable standard construction).

34 **New metallic-tone paint** for office areas, called Opal-Glo, has been announced by Sherwin-Williams Co. Seven colors—gray, rose, aqua, chartreuse, blue, green, and brown. Aluminum, added to the paint during formulation, gives it 50% reflectivity—even in the deeper colors. You get a flat drying enamel-type finish that washes well, wears well.

35 **Block that fire with a block-partition wall.** An 8-hour fire wall at Westinghouse Electric Corp.'s new Columbus, Ohio, plant is 33 feet high, 500 feet long. With existing structures, it provides a 1440-ft. barrier splitting the plant.

36 **Put rolling doors outside an opening.** You can do this with doors made by the Kinnear Mfg. Co., Columbus 16. The barrel, in which the steel curtain coils, can be encased above an

opening on the outside of a building. Frequently, Kinnear points out, this lets you lower the building's ceiling.

37 **A new aluminum roof** at Fort Pitt Bridge Co., Canonsburg, Pa., was applied with self-tapping screw fasteners. Aluminum roofing materials are now available from several manufacturers in several gages. In addition to its standard 0.032-in. corrugated sheets, for example, Aluminum Company of America is now offering a lightweight 0.024-in. sheet. The thinner material is suitable where narrow spans in the roof support don't require extra high-beam strength. And the lighter sheet costs less. Corrugated aluminum sheeting is suited to both new construction and reroofing jobs. It can be used for inner sheets, for outer sheets, or for both, along with an insulating core.

38 **New way to paint rusty surfaces** comes from Surface Engineering Co., Wichita 1, Kan. Materials include Rusty Metal Primer and vinyl, resin-base protective coatings. Primer contains red lead, iron oxide, and a chromate pigment blended in a vehicle that actually "wets" rust.

39 **Corrosion-resistant, resin bonding cement,** called Corobond, is said to withstand acids, alkalies, solvents, hot water, live steam. Good for acid-tile tanks, floors, drains, sewers, and other places where chemical agents may attack masonry joints. Ceilcote Co., Cleveland.

40 **Will today's new plant be big enough tomorrow?** If you think not, you'll be smart to pre-plan an addition. That's what they did at Flexonics Corp. when they put up a new building at Memphis three years ago. They fitted one wall with columns to support the roof of an addition. And they built the same wall of Waylite brick that withstands the weather, but can be razed quickly. Result: They saved time and money in erecting the new addition.

41 **Tilt-up sidewalls** give you rapid, low-cost construction—plus a fire-resistant, easy-to-expand building. Steel-reinforced concrete panels are cast on the plant floor or away from the site. Then they're erected by crane and bolted to a steel frame. Panels are supplied with or without insulation. Costs were cut at Standard Steel Spring Co.'s Gary, Ind., plant by putting up the frame and panels at the same time. Abell-Howe Co., Chicago, did the job.

42 **Bowstring timber trusses**—773 of them—were used in a 28-acre government warehouse at Franconia, Va. The 71-ft. trusses were made by Timber Engineering Co., Washington, D. C. They were assembled on the warehouse site by seven workmen and a foreman, then set on timber columns by crane. The floor and concrete tilt-up wall panels were already in place. The roof deck is wood.

43 **Heavy-duty floor** is made by bedding Ancor 12x12-in. steel plates in concrete. Anchorage points on each plate secure it to the concrete and prevent buckling or other movement. You can put an Ancor floor over new or old concrete, sound wood floors, wood block, or brick. The basic grouting course is selected according to the underlayment. Openings in the plates permit small protected islands of the concrete bedment to surface and form a non-skid pattern. Flash-Stone Co., Philadelphia 40.

44 **New weatherseal for porcelain panels** is made of B. F. Goodrich Koroseal. Used as a joint between architectural porcelain panels, it won't deteriorate or lose its resilience. It is a one-piece extruded strip with a tube-like portion that's compressed between adjoining panels during installation. Developed for Davidson Enamel Products, Inc., Lima, Ohio.

45 **Snow on your roof?** Keep it off with electric heating cables. At its Pittsburgh headquarters, Aluminum Company of America installed 1600 feet of Chromalox Thermwire on a cantilevered concrete canopy to prevent snow and ice from piling up. Alcoa says costs of operating the 8-kw. system are nominal. You can also use Thermwire (Edwin L. Wiegand Co., Pittsburgh 8) on walks, roads, pipelines and gutters. It keeps pipelines from freezing, reduces condensation in roof stacks.

46 **For easy-to-clean interior walls,** why not pick glazed structural tile? It's durable, comes in many shapes and 70 different color shades, and eliminates the need for painting. Parker Pen Co. chose glazed tile for the corridors and washrooms of its Janesville, Wis., plant.

47 **Other interior wall materials** are natural woods such as mahogany, oak, and walnut. You can get finished panels in modular sizes from U. S. Plywood Corp., New York 36. For private offices, you might try striated, textural, 9-in. tiles of styrene plastic. They come in many colors, can be laid in different patterns. You can have a tough, colorful low-cost wall by using integrally finished block materials. They're available from several manufacturers, are good for restrooms, locker-rooms, cafeterias, dispensaries, or production areas.

48 **New kind of truss** was used in H. J. Heinz Co.'s Tracy, Calif., warehouse. The truss has a wooden top chord (because of wood's compression strength) and a steel bottom chord (because of steel's tensile strength). Joists, carried by the top chords, are supported by joist hangers. So the joists and top chords are at the same level, and decking can be fastened to both. Jack trusses, 40 feet long, eliminate every other column and boost the size of bays from 20x50 feet to 40x50 feet. Architect Henry Magg of J. H. Pomeroy & Co., Los Angeles, developed the new truss design. He says it works well with all types of walls.

49 **Three reasons for using glass block** in upper office walls of its new Tonawanda, N. Y., warehouse are cited by Peter A. Frasse and Co.: It permits plenty of light to enter the building; it's an insulating medium; it improves the building's appearance.

50 **Lots of uses for Perlite,** a processed volcanic material in the form of cellular, glass-like particles. Non-combustible. And one-tenth the weight of sand or gravel. Non-absorptive and a good insulating material, too. You can use it for interior base-coat plaster; lightweight fireproofing for structural members; fire-retardant walls and partitions; a base for acoustical plaster; and mortar for laying up tile. It's also good for roof and floor fill; poured-in-place and precast, fire-retardant roof decks; insulating subfloor slabs; lightweight, insulating masonry units; and fire-retardant curtain walls including tilt-up panels. Perlite Inst., New York 16.

51 **Automatic doors speed visitor traffic** at new Westinghouse plant in Columbus. The air-powered doors are electrically actuated by treadle mats.

52 **Field-contructed sandwich walls** can be put up fast and offer you low maintenance, long life, and good insulating value. Unlike prefab walls, they're assembled at the site. Sandwich walls have exterior and interior panels with a filler—often insulation—between them. Outside panels are usually stainless steel or aluminum for wearability and clean appearance. (R. C. Mahon Co., Detroit, supplies panels up to 60 feet high without horizontal joints.) Walls are often modular, can be moved easily. Insulation, from 1 to 4 inches thick, is usually a lightweight material such as fibrous glass.

53 **Spruce up your ceilings, and kill noise,** too, with a new striated, fibrous-glass tile called Stria. Reflects more than 75% of the light striking it, has a noise-reduction coefficient up to 80%. You can clean it with wallpaper cleaner or by vacuum, give it eight coats of non-bridging, water-base paint without affecting its sound-smothering efficiency. Stria's maker says it's fire-safe and won't warp, buckle, rot, expand, absorb or give off odors, or support bacteria, termites, or rodents. Comes in 12x12-in. and 12x24-in. sizes from Owens-Corning Fiberglas Corp., Toledo.

54 **Another decorative noise killer** is Grosgrain Motif'd Acoustone tile. This new mineral tile offers a variety of ceiling effects. You can apply it to wood furring strips, existing ceilings, or exposed wood joists. Or you can install it by the suspension technique to give access to areas above. U. S. Gypsum Co., Chicago 6.

55 **Use it like concrete—work it like wood.** Calsi-Crete can be nailed or sawed. Costs less than regular concrete, weighs one-seventh to one-quarter as much, has 3 to 16 times the insulating value. Forms a good moisture barrier, too—absorbs only 25% as much water as brick. Uses? A slew of them, ranging from pipe coverings to load-bearing walls. Calsi-Crete Corp., Saginaw, Mich.

56 **Super-cold warehouse is wrapped in glass** at Pasco Packing Company, Dade City, Fla. Glass fiber insulation keeps the inside temperature at –15 F. Roof has 9 inches of insulation, sidewalls and floors 8 inches. The building has block and brick walls and a steel roof deck. Inner walls are surfaced with ⅛-in. perforated masonite hardboard, nailed to studs with aluminum nails.

57 **Acoustical ceiling was easy to install** at candy plant of L. S. Heath & Sons, Robinson, Ill. Sonoface glass-fiber panels were simply dropped into a suspended aluminum T-bar grid. They lift out quickly, too. And they're easy to wipe clean because they're faced with Saran sheet plastic.

58 **Want a low fire-insurance rate**—say, 6¢ per $100 valuation? That's what they got at Bert Mills Corp., St. Charles, Ill., by shooting for a fireproof building. The 40,000-sq.ft. plant has a concrete skeleton, masonry walls below windows, and a one-piece, poured-concrete roof. It's divided into five sections by fire walls. Where explosions are possible, windows have scored glass that blows out easily.

59 **Lead sheath protects plating room floor** at Westinghouse's Columbus, Ohio, plant. The ¼-in. sheath was applied to the concrete floor slab, sealed at all joints, and connected to floor drains leading to sewer lines. Separate plating areas have curbs to segregate corrosive wastes. Wood duckboards elevate workmen above the lead pans.

Albany Felt has maintained its turn-of-the-century architectural style through the years.

That's why you can't tell the original 1902 plant from the 1910, 1918, 1921, 1948, and 1954 additions.

Plant interiors all look alike, too—but all modern. This plant is...

MAINTENANCE OF ARCHITECTURAL STYLE is dramatized by this sequence of pictures (from Board Chairman C. P. Drumm's collection). In 1902 (above), five-story tower was only office space. Original area of factory can also be seen.

1900 on the Outside, 195X on the Inside

NAME: Albany Felt Company
LOCATION: Albany, N. Y.
PRODUCT: Felts
EMPLOYEES: 1300

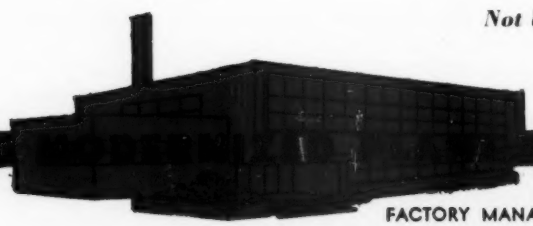
Albany Felt Company has been expanding and modernizing great guns for over 50 years (as you'll see by the diagram on the next two pages). But it hasn't become a hodge-podge of old and new in the process. The architectural style of the original mill has been retained in every addition, even to the new office section completed in March of this year.

The result is an architectural integrity that gives the buildings the appearance of a single unit. Of course, the architecture is necessarily 1900 vintage. But when the first section of the plant went up in 1902, it was an elegant example of the finest "New England mill." Good maintenance has kept it that way. Fine landscaping and careful groundskeeping have given Albany Felt a setting in the midst of a heavily industrialized area that makes the plant almost a landmark.

Adding to the distinctiveness of the mill is a flock of black swans on the artificial lake (formerly a storage reservoir) between the plant and street. And the annual trimming and lighting of the 75-ft. Christmas tree on the shore of the lake is a notable civic event.

Fine community relations, you might say, but what about the mill itself? Are the production facilities and services right in keeping with the turn-of-the-century exterior?

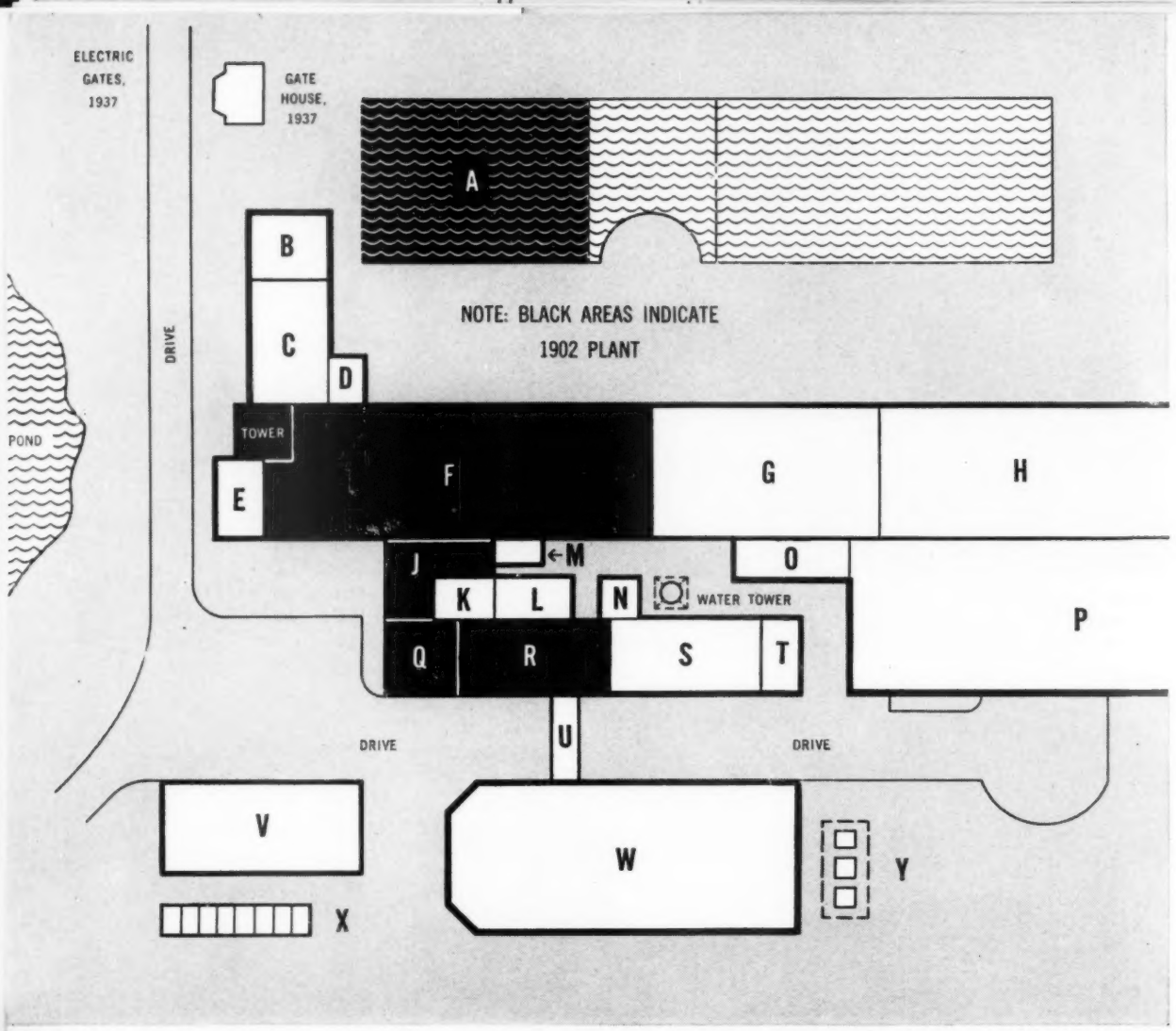
Not by a long shot. Turn the page



IN 1918 a two-story section was added to the office. You can also see the 1910 addition at the rear of the factory area (if you want to stop and count windows as we did). In 1926 a third story was added to the office. In 1927 a three-story addition went up. In 1948 a fourth story was added, and . . .

IN 1954 the latest office addition, the four-story section at the right, was added. As soon as the brick weathers a bit, the new section will blend perfectly with the rest of the building. In the time span covered by these three pictures, more than 40 major expansion and modernization projects were carried out in the factory area.

B



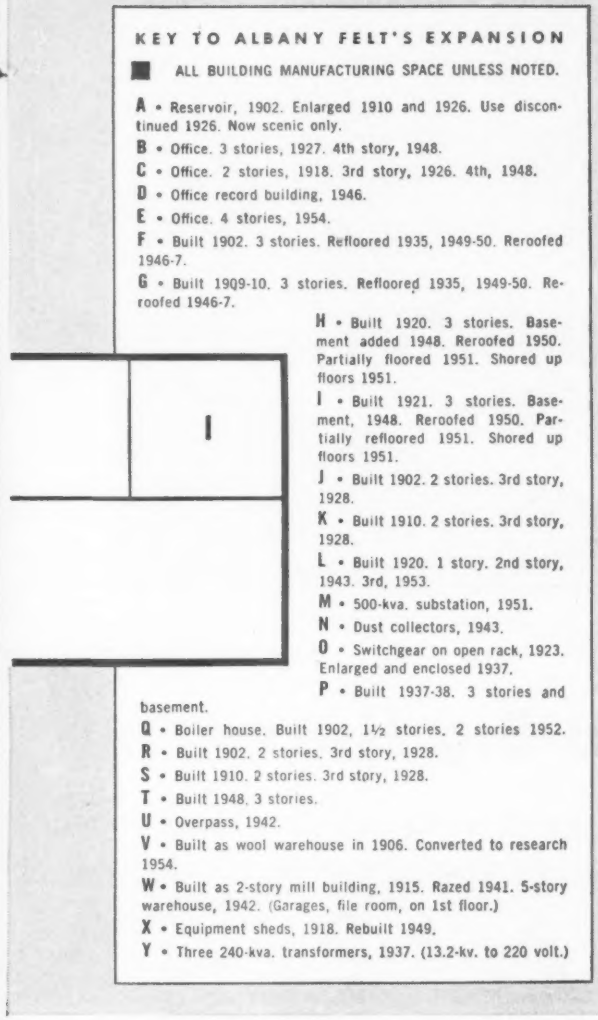
1900 ON THE OUTSIDE. 195X ON THE INSIDE . . . *Begins on page B-12*

The interior of each new section at Albany Felt has been thoroughly modern. And, at the time of the additions, older sections have been updated to keep pace. For example, individual motor drives were used on the machines placed in the sections built in 1920-21. In 1922 individual drives were provided for the machinery in the older sections, and the overhead line-drives removed. The first post-World War II construction incorporated fluorescent lighting. Conversion of the older sections started soon thereafter, and now includes virtually everything but the 1937-38 addition (which had a high-intensity mercury-vapor installation).

What price consistency? Since Albany Felt has not even considered "modern" design for its building addition, it's impossible to answer the question, "How much more does it cost to stay with the original architecture than to add 'modern' units?" But it's pretty obvious that all-brick, mill-type construction doesn't take advantage of the latest cost-reducing ideas in either building materials and methods—or in maintenance.

What advantage consistency? There's the "mark of distinction," of course, and a physical emphasis on such intangibles as continuity of character and integrity. Those are the reasons cited by Felt's top management for the deliberate "anti-modern design" policy. And those reasons are widely understood and agreed to among employees. They apparently find a "plus value" in working there.

And at least some of the employees are conscious of the fact that no one has to work in "the


KEY TO ALBANY FELT'S EXPANSION
ALL BUILDING MANUFACTURING SPACE UNLESS NOTED.
A • Reservoir, 1902. Enlarged 1910 and 1926. Use discontinued 1926. Now scenic only.
B • Office. 3 stories, 1927. 4th story, 1948.
C • Office. 2 stories, 1918. 3rd story, 1926. 4th, 1948.
D • Office record building, 1946.
E • Office. 4 stories, 1954.
F • Built 1902. 3 stories. Refloored 1935, 1949-50. Reroofed 1946-7.
G • Built 1909-10. 3 stories. Refloored 1935, 1949-50. Reroofed 1946-7.
H • Built 1920. 3 stories. Basement added 1948. Reroofed 1950. Partially floored 1951. Shored up floors 1951.
I • Built 1921. 3 stories. Basement, 1948. Reroofed 1950. Partially refloored 1951. Shored up floors 1951.
J • Built 1902. 2 stories. 3rd story, 1928.
K • Built 1910. 2 stories. 3rd story, 1928.
L • Built 1920. 1 story. 2nd story, 1943. 3rd, 1953.
M • 500-kva. substation, 1951.
N • Dust collectors, 1943.
O • Switchgear on open rack, 1923. Enlarged and enclosed 1937.
P • Built 1937-38. 3 stories and basement.
Q • Boiler house. Built 1902, 1½ stories. 2 stories 1952.
R • Built 1902. 2 stories. 3rd story, 1928.
S • Built 1910. 2 stories. 3rd story, 1928.
T • Built 1948. 3 stories.
U • Overpass, 1942.
V • Built as wool warehouse in 1906. Converted to research 1954.
W • Built as 2-story mill building, 1915. Razed 1941. 5-story warehouse, 1942. (Garages, file room, on 1st floor.)
X • Equipment sheds, 1918. Rebuilt 1949.
Y • Three 240-kva. transformers, 1937. (13.2-kv. to 220 volt.)

old mill." Except for the air conditioning in the offices, no distinction can be made between sections built in 1902 and 1954.

Problems of updating · When you come right down to cases, little remains of the original mill except the masonry shell. New floors have been installed throughout—partly in 1935, partly in 1949-50 (including replacement of wood with concrete in some areas in 1949). A new roof was put on in 1946-47.

Originally, heat was supplied through a 5x8-ft. trench from the boiler house. A Sturtevant fan forced it up a buttress on the rear of the building, for distribution "catch as catch can" through the working areas. Additional boiler capacity in 1926 made it possible to begin use of unit heaters. Since World War II, the plant has been slowly converting to the use of steam-heated wall convectors.

The air conditioning in the new office building has an "added feature" that permits minor variations in the individual offices within various zones. A local thermostat causes chilled water to circulate through finned convectors beneath the windows; and a two-speed fan is located behind the convectors. By turning on the fan to low or high speed, the general zone temperature (established by air flowing in through the diffuser grill) can be lowered by 2 to 4 degrees in the particular office. In the winter, warm water in the convectors allows the temperature to be raised above the zone level in the same manner. An outdoor thermometer controls the temperature of the water in the convector circulating system.

The electrical distribution system, too, has been in a process of constant modernization. The earliest plant records available show that in 1928 (six years after conversion to individual motor drive), the plant had 933 horsepower of connected motor load. Power was supplied by overhead line to a bank of small transformers at the rear of the plant.

By 1940 the connected motor load reached 1600 horsepower. But three years earlier the company had installed three 240-kva. transformers out in the yard, and built a housing for panel-mounted switchgear next to the old platform. In anticipation of future load, a 2500-amp. main breaker was installed, with 400-amp. feeder breakers on the 220-volt distribution lines to the plant. At this time a separate 200-kva. system was provided for the plant lighting.

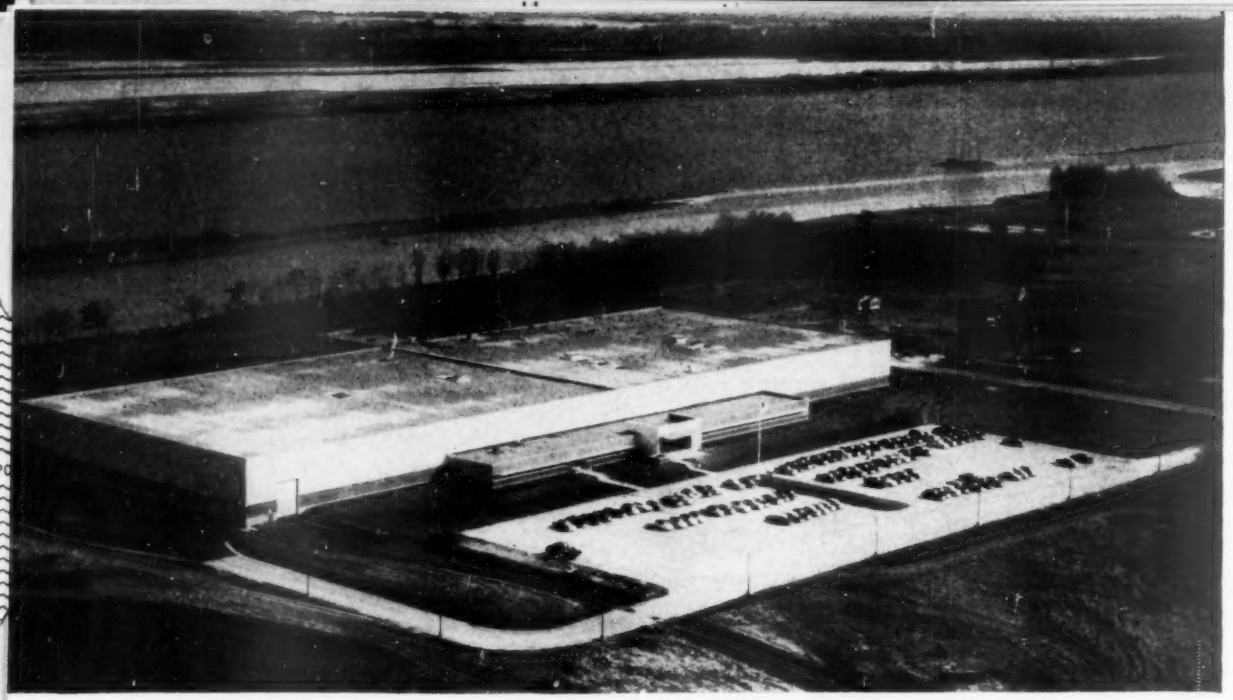
Because of the continued expansion in power demand, a 500-kva. package substation was added in 1951. This handles the entire load in the south end of the plant, including lighting. The primary feeder (13,200 volts) is brought in underground. To protect against an outage, this substation is tied back to the main switchgear.

At the end of 1953 connected motor load had reached 2975 horsepower. So plans are now under way for another 750-kva. package substation, and eventually for a third to replace the present gear, all tied into a network system.

At the same time that the transforming capacity was being increased, the company also started installing plug-in bus duct in the plant whenever replacement of sections of the old system was needed, or where additional capacity was called for. This program is continuing.

The demand for steam has paralleled the growth in electrical demand. Up to 1925 two units rated at 150 boiler horsepower carried the load. At that time, a third was added. In 1936 two original boilers were replaced with new ones of greater capacity, making the total rating of the installation 770 boiler horsepower.

For air compressors the modernization story is repeated. Up to 1937 the company used 1½-hp. portable compressors. Then a central compressor was installed. In 1944 and in 1951, two new compressors were added. And right now all three of these are being replaced.

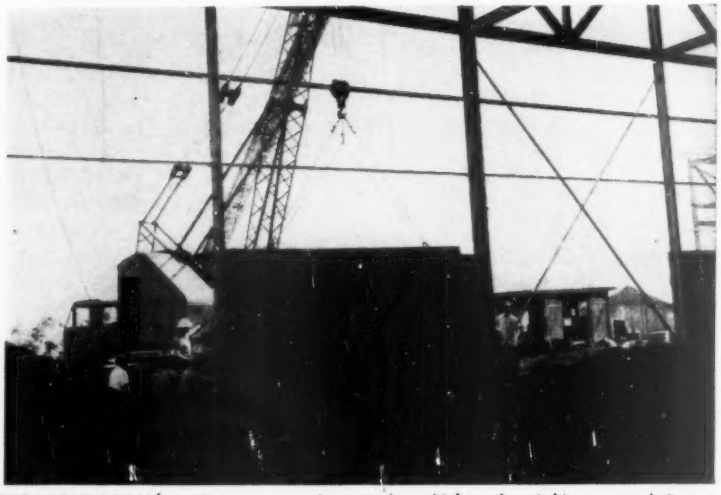


WORTHINGTON'S NEW WINDOWLESS PLANT LOOKED LIKE THIS IN LESS THAN SIX MONTHS AFTER BREAKING GROUND.

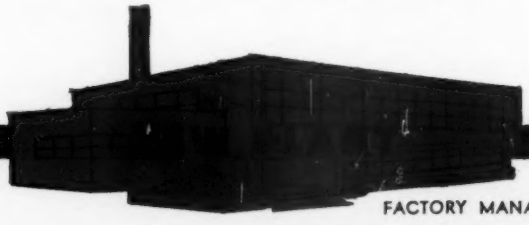
Big New Plant in a Big Hurry...

. . . with 195X building methods and materials like concrete tilt-up panels . . .

NAME: Worthington Corporation
LOCATION: Decatur, Ala.
PRODUCT: Packaged air conditioning equipment
EMPLOYEES: 400
DESIGNER, ENGINEER, AND BUILDER: The Austin Company, Cleveland



EXPANSION WALL • Concrete panels, 6 inches thick and weighing around 7 tons apiece, were tilted into position between columns by crane. These panels were used on the side of the plant where future expansion is planned. Since they're simply bolted to building columns, they'll be easy to remove, and use again.



A SIGNIFICANT TO GUIDE YOUR

This plant was built to meet a deadline. Worthington executives wanted to produce packaged air conditioning units in time for the 1954 selling season. They broke ground in May 1953. By December they started production.

The photos show some of the recent developments in methods and materials that made the fast construction job possible. Others:

Planks (in 3-in. panels up to 4 feet by 8 feet) of the same fiber insulation used in the factory walls were used for the office roof. Its appearance made a drop ceiling unnecessary. Its structural strength permitted laying of a 4-ply tar-and- limestone chip roofing directly, without decking.

The use of special H-section 80-ft. welded trusses cut down the framing time by eliminating columns and on-the-job fabrication.

Flexible layout · Although the H-section trusses are on 20-ft. centers, the use of 40-ft. jack trusses (perpendicular to the 80-footers) made columns necessary only at every other main truss. Bay size therefore is 80 by 40 feet.

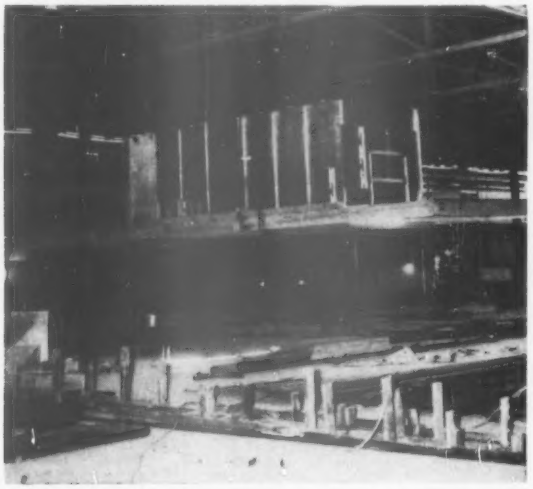
These H-section trusses have the capacity to carry loads at any point along their length. Worthington's layout people were free to install overhead conveyors, air conditioning platforms, and other equipment at whatever point in the trusses best served their purposes. In addition, the floors have been designed to withstand any loads imposed by production equipment except the few pieces that require special foundations.

Low-cost maintenance · Elimination of windows in the plant and limited use of windows in the office building mean almost no window washing and sash maintenance. Use of glazed tile in toilet rooms simplifies housekeeping. Catwalks between the overhead air conditioning platforms make it easy to change filters. Formed aluminum and corrugated asbestos exterior walls do not require painting, only a minimum of care. Fluorescent fixtures will be relamped from monorail bridge cranes.

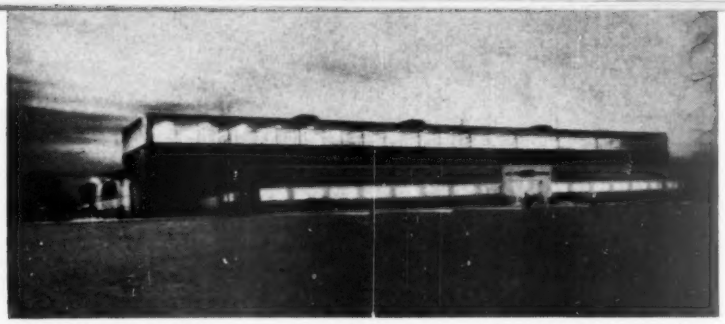
Air conditioning · Temperature and humidity conditions are maintained at levels conducive to maximum productivity, quality and employee comfort. Basic ventilation equipment (supplying 400,000 cfm.) is an integral part of building design. The addition of atmospheric cooling, which required 300 tons of refrigeration, increased total heating, ventilating, and air conditioning costs by less than 50%. Windowless construction, use of insulation in walls and roof, and the white limestone chips used on the roof—all serve to reduce the load on the heating and cooling systems.

. . . corrugated asbestos and fiber wall panels . . . and complete air conditioning units

PERMANENT WALLS · On other three sides, corrugated asbestos panels were speedily erected, minimize maintenance. Fiber insulating panels cut load on air conditioning, provide good acoustics, look good—all at low cost.



PACKAGED AIR CONDITIONING · Six air conditioning platforms—including a 20,000-cfm. fan unit, chilled water cooling coils, heating coils, and filters—were assembled on the floor, hoisted into position as a unit.



MOTORIST'S-EYE VIEW of new Cyril Bath plant at night. All-brick front wall and landscaping enhance appearance. There's plenty of room on 17-acre site for expansion of the 51,000 sq. ft. plant, macadam parking lot, baseball diamond for mid-day recreation.

Good-Looking, Flexible,

Built-in flexibility and expandability were uppermost in the minds of the men who planned this new plant for The Cyril Bath Company.

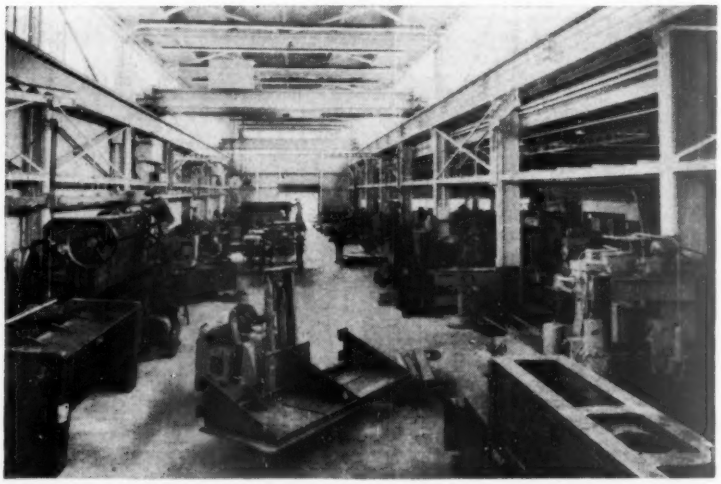
High clearances, large bays, careful layout of utility service lines provide for quick changes.

Relayout, if that becomes necessary in the future, will be easy. The only "immovables" in the plant are a few heavy pieces of equipment that require special foundations, shop offices and toilet areas.

The large site and curtain walls make expansion of the building itself easy. In addition, the 33-kva. substation, the main feeders of the electrical distribution system, the sewage disposal system, and the plant boilers are sufficiently oversize to handle any foreseeable future requirements.

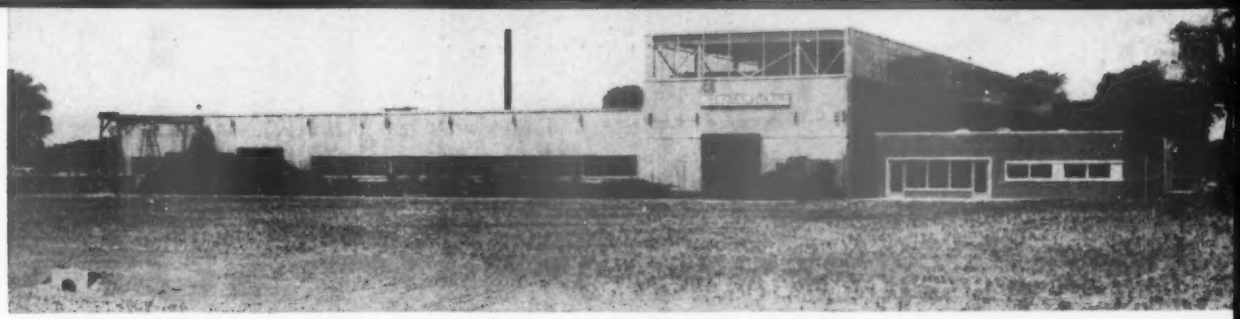
Solon, Ohio, site (about 21 miles from Cleveland) was picked, say company executives, because "it offers good rail and highway facilities, and a low

NAME:	The Cyril Bath Company
LOCATION:	Solon, Ohio
PRODUCTS:	Metalworking machinery, aircraft and auto parts
EMPLOYEES:	165
ARCHITECT:	Dalton-Dalton Associates, Cleveland
BUILDER:	Leonard H. Krill Company, Cleveland



EVIDENCE OF FLEXIBILITY designed into plant can be seen in this view. Clearances throughout the shop are ample. Height of this bay makes it possible to assemble largest units without interference to 20-ton overhead cranes. Bays are 30-foot minimum, 50-foot maximum. Shop floors are strong enough to hold all but the heaviest pieces of equipment. Both compressed air and electrical lines run in a regular pattern throughout shop, making machine hook-up at any location possible.

A SIGNIFICANT TO GUIDE YOUR



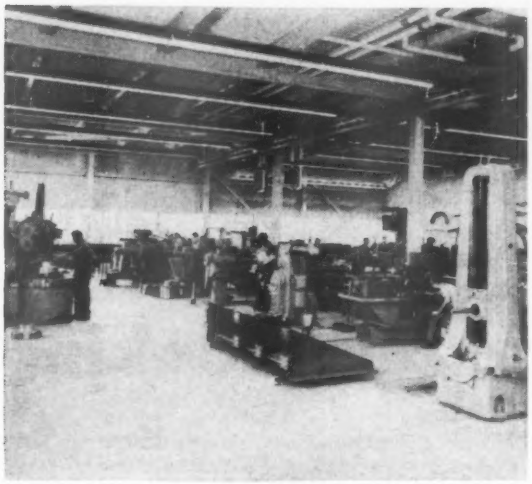
ON REAR AND SIDES of plant, corrugated asbestos panels backed up by fibrous insulating board provide a lightweight economical wall with low heat transmission. On all but this side, masonry is used to window-sill level; here entire wall is panel. Steel frame is independent of masonry, so any of three walls is easily removable for plant expansion.

Expandable for 195X Needs

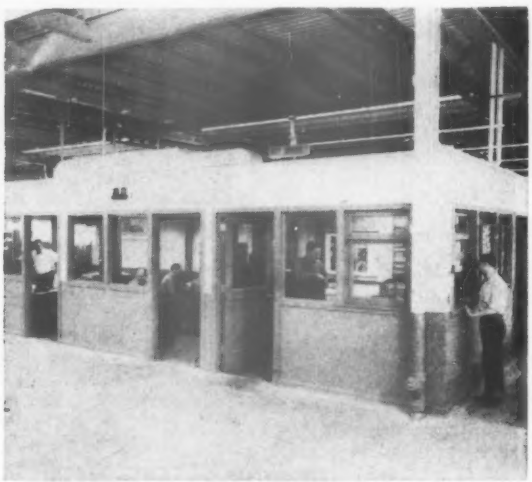
tax rate." Local zoning ordinances restrict the area to smaller industries.

Also of interest:

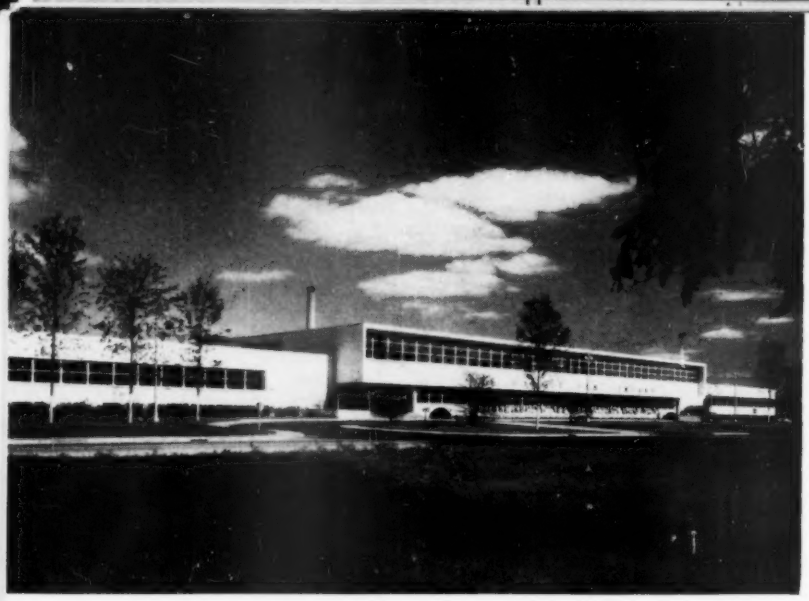
- Office floors are greaseproof asphalt tile for good appearance, protection against metal particles and oil that might be carried in from shop.
- Office is heated by conventional hot water radiation, comfort-cooled in summer by five self-contained air conditioning units.
- Cafeteria overlooks landscaped grounds. In summer, tables can be moved to outdoor paved area.
- Boilers are of the dual-fuel type (oil-gas). They operate on oil now; will switch to gas as soon as it's available, use oil as emergency stand-by.
- The receiving and shipping department (not visible in photographs) is located at the rear of the building, has facilities for loading or unloading several freight cars under cover.



WORKPLACES are spacious throughout plant. Narrow vision-strip windows are small enough to eliminate excessive heat loss, provide for control of natural light. Hot-water unit heaters and roof ventilation keep shop comfortable winter and summer. Shop floors are concrete. Roof is built-up tar and gravel on metal pans with asbestos-impregnated insulation.



SHOP OFFICES are provided for superintendent, foremen, and timekeepers. They are centrally located so that they will not have to be moved if plant is expanded. Shop toilets are also in this central area. Main locker room is in office area. Glazed tile walls are used in toilet and wet areas. Other interior walls are lightweight cast masonry.



WHETHER YOU LOOK AT THE FRONT . . .

. . . OR THE REAR . . .

. . . OR THE INTERIOR . . .

YOU'VE GOT TO WONDER:

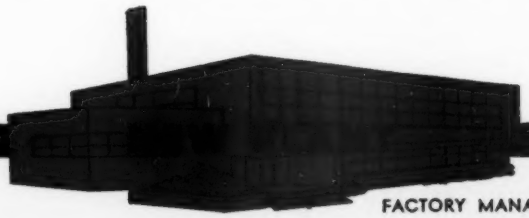
IS THIS **The Best-Looking**

NAME:	The Parker Pen Company
LOCATION:	Janesville, Wis.
PRODUCTS:	Fountain pens, mechanical pencils, desk accessories
EMPLOYEES:	About 1500.
ARCHITECT:	John J. Flad & Associates Madison
ENGINEER:	Beling Engineering Consultants, Moline, Ill.
BUILDER:	T. S. Willis, Janesville
LANDSCAPE ARCHITECT:	Robert B. Harris, Chicago

Maybe not. But a Madison newspaper reporter's comment, after visiting the plant, was: "They ought to put up signs saying 'This is a factory.' " We think he had something there.

The $4,500,000 plant, over two years in building (it was occupied and in full production July 13, 1953), will house all of the company's production. Its 212,500 square feet represent a 235% increase in production capacity over previous facilities.

The production area is fully air conditioned. Precipitators clean 400-million cubic feet of air per day, enable company (through an



A SIGNIFICANT TO GUIDE YOUR

FRONT VIEW • Parker Pen's new Arrow Park plant in Janesville, Wis., is situated on a 15-acre landscaped (including 1168 trees) plot overlooking the Rock River. Exterior is stone-face Roman brick. Windows are double-layer heat- and light-resisting, diffusing glass. Doors, sash, and trim are aluminum.

REAR VIEW is just as handsome. Left, main manufacturing area, with truck dock in background. Right, entrance to service building, which houses boilers and other plant equipment—and cafeteria.

INTERIOR • This section of the toolroom is typical of production and assembly areas. All ceilings are acoustical. The 1700 277-volt, 8-ft. fluorescent lamps are flush-mounted, provide an average of 70 foot-candles at every workplace. Walls are light and dark green tile. Floor is reinforced concrete, cast on piers.

Plant of the Year?

experimental arrangement with the Wisconsin Industrial Commission) to introduce less than the normally required volume of outside air. All air conditioning and fume exhaust ducts are concealed between the drop ceiling and the roof or floor above.

A service chamber below the plant floor contains electrical, steam, water, and gas services. It is large enough for maintenance men to work in conveniently; it is accessible through ports cast in the concrete floor on 6-ft. centers, so that relocation of equipment will be easy.

Plant has a hard-surfaced, floodlighted parking lot for 475 cars.

What does the community think of its new neighbor? Janesville's population is 24,829. Guests numbered 14,000 the day the plant was opened to visitors from the town. We think that score is significant of the community's reaction.

Turn to next page

EMPLOYEE SERVICES EQUALLY ATTRACTIVE

It's obvious that employee relations and employee convenience ranked high in the minds of the plant's planners. A glance at a few of the employee service facilities will convince you.

FIRST-AID ROOM is fully equipped. The treatment room, head nurse's office, and restrooms for both men and women are adjacent. Note the use of tile walls and acoustical ceiling; and the smooth-surfaced, easy-to-keep-clean cabinets.

SEVERAL WASHROOMS like this are conveniently located throughout the plant. Off-the-floor toilet fixtures and compartments, tile floors, and walls again indicate emphasis on appearance, cleanliness, and ease of maintenance. You can see that flush lighting and air conditioning systems have been extended to these areas. Modern fixtures, adjacent locker facilities make end-of-day wash-up convenient.

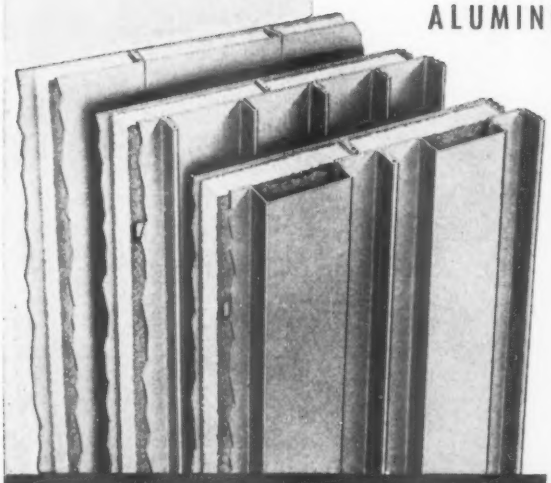
YOU'D ALMOST HAVE TO ENJOY your lunch in these surroundings. Ceilings are acoustical; floors, vinyl tile; walls, mahogany and Colorado stone. Visible (above clock) is one of 400 speakers in plant sound system, which can direct music and announcements to selected departments.

AND FOOD OUGHT TO BE GOOD with serving and cooking facilities like these. Extensive use of glazed tile and stainless steel makes cleanliness easy. Cafeteria serves around 600 meals per day, partially subsidized by the company (as you can see by the prices on the menu board).

INSULATED METAL WALLS

for INDUSTRIAL and COMMERCIAL BUILDINGS

ALUMINUM, STAINLESS or GALVANIZED STEEL



FLUSH, RIBBED, or FLUTED

Over-all "U" Factor of Various Types is Equivalent to or Better than Conventional 16" Masonry Wall

Insulated Metal Walls have not only gained universal acceptance from a practical and economical standpoint, but are today recognized by architects as a component which, when combined with masonry or other materials, opens new potentialities in exterior design effects. The building below, which is a combination of Mahon Aluminum Insulated Wall Panels and brick, is an outstanding example of the architectural effects obtainable. Insulated Metal Walls offer definite advantages in lower cost of both materials and labor, reduction in construction time through rapid erection—plus the fact that these walls can be erected in sub-zero weather. Mahon Insulated Metal Walls are available in the three exterior patterns shown at left. The Mahon "Field Constructed" Fluted or Ribbed Wall can be erected up to sixty feet in height without a horizontal joint—a feature of Mahon walls which is particularly desirable in powerhouses or other buildings where high expanses of unbroken wall surface are common. See Sweet's Files for information, or write for Catalog No. B-54-B.

THE R. C. MAHON COMPANY

Detroit 34, Mich. • Chicago 4, Ill. • Representatives in All Principal Cities

Manufacturers of Insulated Metal Walls and Wall Panels; Steel Deck for Roofs, Partitions, and Permanent Concrete Floor Forms; Rolling Steel Doors, Grilles and Underwriters' Labeled Rolling Steel Doors and Fire Shutters.

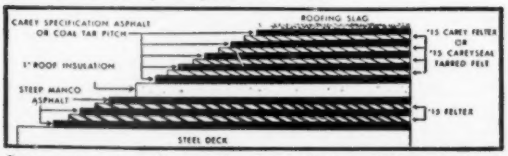
MAHON

Carey announces another great

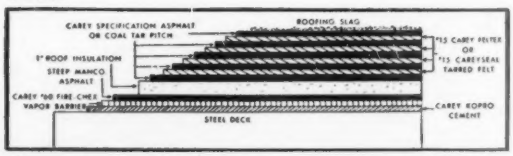
FIRE-CHEX

At the Carey Research Laboratories, this fire test of a conventional-vapor seal, with insulation and built-up roofing over steel deck, showed the dripping of asphalt from the vapor seal igniting as 1800° of heat builds up under the roof construction and melted bitumen flows through the joints in the deck.

Fire test of conventional-type built-up roof with new *Fire-Chex 1-ply Vapor Barrier* over the steel deck (see diagram). Here you'll note a *complete* absence of any dripping material and only slight burning of gases. Practically no fuel is contributed to the fire by vapor barrier.



Cross-section view of conventional-type 2-ply asphalt vapor barrier, insulation and roof.


CAREY SPECIFICATION ASPHALT OR COAL TAR PITCH
ROOFING SLAG
1" ROOF INSULATION
STEEP MANCO ASPHALT
CAREY #60 FIRE CHEX VAPOR BARRIER
STEEL DECK
#15 CAREY FELTER OR #15 CAREYSEAL TARRED FELT
CAREY KOPRO CEMENT

Cross-section view of Fire-Chex type 1-ply asbestos-plastic vapor barrier, insulation and roof.

achievement in Fire Protection...

VAPOR BARRIER

for built-up roofs

Perfected after years of research and testing—now ready to give your buildings a new all-time high in fire-safety

Carey

When you have Fire-Chex Vapor Barrier on the job, there's no guesswork about fire-safety where your built-up roofing is concerned. Carey Fire-Chex Vapor Barrier, made with time-proven asbestos-plastic, stops spread of fire . . . does not release excessive combustible gases!

Carey Laboratory Tests indicate that the conventional asphalt vapor barrier releases two combustible materials when exposed to 1800° F. temperatures—melted asphalt and gases.

In Carey Fire-Chex Vapor Barrier, you have a "fireman" on duty 24 hours a day over every inch of your roof! The materials in Fire-Chex do not melt and flow under flames and heat. Nor does Fire-Chex release excessive gases. Even when installed over a steel deck that's heated red-hot, Fire-Chex remains intact. (See test photos.)

And here's more good news. You can give your buildings the priceless protection of Fire-Chex for just a few cents more per square of roofing than the cost of a conventional asphalt vapor barrier. Mail the coupon for all the facts, or to ask a Carey Industrial Sales Engineer to call without obligation.

Quick Facts About

Fire-Chex Vapor Barrier

MATERIAL REQUIRED FOR ONE SQUARE OF ROOF AREA

1 roll Fire-Chex Vapor Barrier—
weight approximately 60 lbs. per 114 square feet:
size 38 feet long, 36 inches wide
1 gallon Kopro Cement

The Philip Carey Mfg. Company

LOCKLAND, CINCINNATI 15, OHIO

In Canada:
The Philip Carey Co., Ltd., Montreal 3, P. Q.

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☐ *Please send specifications and details of new FIRE-CHEX VAPOR BARRIER.*

☐ *Please have Carey Industrial Sales Engineer call.*

*NAME*_____

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*CITY*_____ *ZONE*____ *STATE*_____

You name it, STANDARD'S got

Save time, trouble . . . get all these maintenance supplies from your Standard Oil Industrial Salesman

Standard Liquid Wax — recommended for linoleum, asphalt tile, rubber tile, composition, and finished hardwood floors. Easily applied with mop or pad. No buffing. Gloss lasts for weeks . . . and is scratch-resistant under heaviest traffic.

Standard Penetrating Sealer — Heavy Duty. For any floor that takes a beating — wood, cork, composition, masonite-type, concrete. Seals pores with hard, waterproof gums and oils. Gives a non-glossy, slip-retarding surface that won't show traffic lanes.

Standard 2, 4-D Weed Killer — Amine Concentrate (to be mixed with water). A selective weed killer for sure control of broad-leafed weeds such as dandelions and plantains. Scientifically developed and proved in field use.

Standard Crabgrass Spray—completely destroys Crabgrass and prevents seeding. Effective on any size area. Will not harm desirable grasses. Gives fast, long-term control.

Standard carries a *complete line* of high quality maintenance products, including:

Standard Insect Spray with DDT — powerful, residual killer, potent against crawling insects inside buildings.

Standard 25% DDT Concentrate, an emulsified DDT insecticide for outdoor fly and mosquito control.

Standard Roach and Ant Spray for hard-to-kill crawling insects.

Standard Dormant Spray Oil No. 1 (Dendrol) for elimination of overwintering forms of pests on trees.

Standard Summer Emulsion Concentrate (Verdol), safest summer tree spray oil available.

Standard Elm Spray — destroys the insect carriers of elm phloem necrosis and Dutch elm disease.

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Standard Garden Dust — quickly controls many garden pests and diseases.

Standard Brush Killer — effective against oak, hickory, elm, poison ivy and other unwanted brushy plants.

Standard Liquid Gloss — cleans and polishes furniture and woodwork in one operation.

Standard Super Finish — gives high gloss finish to gym and other wood floors.

it, for easier plant upkeep!

See your S.O. Industrial Salesman! when you need products for floor, tree, lawn care . . . insect and weed control

That's right! The same man who brings you cutting and lubricating oils now handles a complete line of maintenance products for your convenience. Order "the works" from him, and keep your plant performing and looking its best, inside and out, with these fine quality products by Standard.

Remember: For easier, more efficient plant maintenance, the man to see is your familiar Standard Oil Industrial Salesman. He's ready to be of service anytime. Just give him a call. Remember, too, fast delivery service from hundreds of well-stocked warehouses all over the Midwest.

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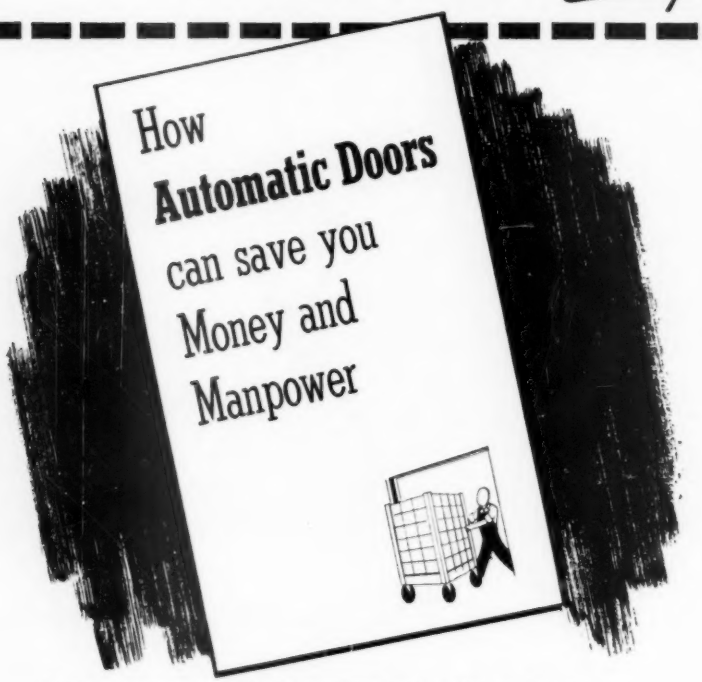
STANDARD OIL COMPANY (INDIANA)

Write for this
FREE BOOKLET *today!*



Explains how automatic door control and safety equipment installations:

- improve and speed up materials handling flow
- maintain correct temperatures and humidity
- reduce air conditioning operation costs
- seal off hazardous areas and control fires
- exclude dust, dirt, drafts and noxious gases

There's a lot of sound information in this free 8-page booklet for owners and operators of industrial plants, restaurants, hotels, supermarkets, stores and office buildings. It was written by experts in the field of automatic door and safety control equipment — and prepared to help you increase efficiency and cut operating costs.

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NEW FREE CATALOGS

BUILDINGS & GROUNDS

OTHER SECTIONS:

Production ..... *Page 176*
Electrical Distribution *C-36*
Plant Services *D-29*

1 · Concrete Floors. This 24-page booklet describes heavy-duty concrete floors made by company that specializes in their construction. Information on organization, selection of materials, special installation process. *Kalman Floor Co.*

2 · Safety Walk. Here's the story on a pressure-applied anti-slip material. Specifications, suggested applications, and sample of the material. Gives directions for installation, lists prices. *Minnesota Mining & Mfg. Co.*

3 · Chimney Construction. This 4-page bulletin illustrates and describes projects completed and facilities offered by chimney specialists. Tells how chimney is built and maintained. List of users. *Rust Engineering Co.*

4 · Toilet Compartments. Metal toilet compartments are subject of this 12-page catalog (No. 530). Shows available colors, gives features, specifications, hardware and fittings, and installation data for complete line. *Fiat Metal Mfg. Co.*

5 · Insecticides and Sprays. Here's a group of folders on maker's line of insecticides. Describes constituents of each, tells how to use. Safety hints. Gives recommended strength, too. *Standard Oil Co.*

6 · Weed and Brush Control Folders. Tells what weed killers and pesticides to use for any kind of lawn or grounds problem. Lists

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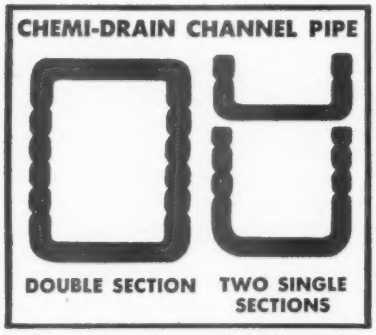
Solve Your Corrosive Waste Disposal Problems

with LOGAN'S new

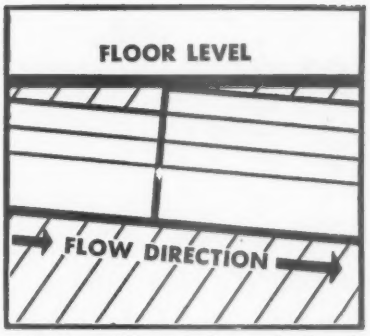
Chemi-Drain®

CHANNEL PIPE

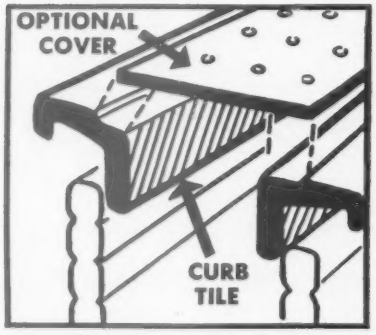
Here's an entirely *new* kind of Channel Pipe — designed by Dow Chemical Company and produced by Logan especially for drain or gutter service wherever chemical or corrosive waste disposal is a problem. Chemi-Drain is made of never-wear-out Vitrified Clay for *permanent* corrosion-proof service.



- The sides of each double section of Chemi-Drain are fluted for quick, easy separation into channel pipe drain sections of any desired inside depth from 4 to 12 inches.



- By installing sections of Chemi-Drain of progressively increasing depths, you get a sloping drainage line that has excellent flow characteristics and freedom from accumulation of sediment.



- Installed in concrete floors with Chemi-Drain Curb Tile, this new pipe makes a permanent, corrosion-proof drain that can be covered with either a grill or a solid plate flush with the level of the floor.

WRITE FOR COMPLETE INFORMATION on how this exclusive new Logan product can help you solve corrosive waste disposal problems in your plant. Address inquiries to: The Logan Clay Products Co., Box 698A, Logan, Ohio.

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WHETHER you're responsible for selection, installation or operation, here is a booklet that can show you the way to save money. It tells about the many outstanding features of the new Ring-Tite® Coupling; how water line assembly time is saved every step of the way; how it saves at valves, hydrants and fittings; how it pairs up with Transite® Pressure Pipe, the asbestos-cement product, that gives the utmost in industrial water supply service and in fire line use.

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TRANSITE PRESSURE PIPE

WITH NEW RING-TITE COUPLING

each type, gives specifications, lists cautions. How-to-use information included. *Standard Oil Co.*

7 · Floor Maintenance. This folder gives you a rundown on maker's complete line of floor maintenance products. Waxes, finishes, and sealers are included. Lists features and advantages of each. Application data. *Standard Oil Co.*

8 · Standard Steel Buildings. Lots of drawings here to bring maker's line of products before you. Catalog BC-541 includes rigid-frame, truss-type, panel-type, and special buildings. 22 pages. *Steelcraft Mfg. Co.*

9 · Steel Buildings. Here's a 28-page catalog (No. B-53) giving construction features on a complete line of packaged buildings. Illustrations show different models and suggested uses. *Ideco Div., Dresser-Stacey Co.*

10 · Prefab Buildings. Several types of standard steel buildings are shown in this 6-page illustrated folder and leaflet. Specifications, advantages, construction details also included in the package. *The H. L. Vokes Co.*

11 · Precast Concrete. This "manual of precast concrete construction" is a 102-page illustrated volume. Covers everything from making forms to costs. Data on new methods of construction. Index and extensive bibliography. *F. Thomas Collins & Associates.*

12 · Floors. You can read about steel-clad concrete floors in maker's 16-page bulletin. Gives advantages and design and construction features. Tells how flooring is installed. Specifications, too. *The Flash-Stone Co.*

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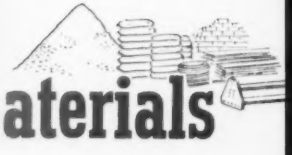
the five **M's** *of construction...*

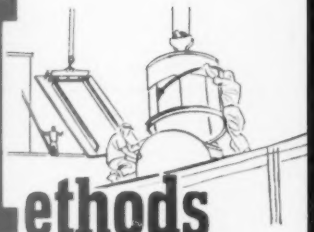
Men

Machines

Materials



Methods



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Engineers and Constructors

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Wise manufacturers invest for the future . . . in expandable, flexible, minimum maintenance, low-cost buildings

IDECO® buildings...

Predesigned, Permanent, Custom-Planned to fit YOUR needs

Flexible Arrangements with column-free floor area and unobstructed overhead space are essential in today's production or warehouse building . . . shop-fabricated Ideco steel buildings provide clear spans up to 180′, unobstructed heights up to 40′, in any length . . . select from a variety of styles. *Maintenance costs* are kept to a minimum by rust-resistant galvanizing of roof and wall sheet, steel sash and exposed structural members.

Ideco permanent buildings can be erected with deep-rib steel sheet for walls and roof . . . or the Ideco shop-fabricated steel framework can be combined with built-up roof and walls of masonry or other building materials. Any Ideco structure can be economically insulated for all-weather comfort . . . office areas are easily created.

Large area of unobstructed floor space is typical of all Ideco buildings

Take advantage of the complete building service offered by your Ideco Building Consultant. He's equipped to work with you . . . or with your architect, contractor or engineering department . . . to insure that your new building will best meet your needs, at minimum cost.

For low-cost housing of plant or warehouse . . . in a hurry . . . the new UTILIMASTER* rigid frame "package" building by Ideco. Delivery to your site in 30 days . . . erection of a typical 50′ x 100′ building in only 10 working days! "Utilimaster" offers the same permanency as larger Ideco structures . . . gives a floor area unobstructed by columns, with clear spans of 40′, 50′, 60′ . . . expanded easily, economically. Tapered rigid frame eliminates interference from trusses, provides more cubic feet of usable space.

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We are considering a building _____ *ft. x* _____ *ft.*
to be used as _____

NAME _____ POSITION _____
COMPANY _____
STREET _____
CITY _____ ZONE _____ STATE _____

NEW FREE CATALOGS

Begins on page B-28

13 · Abrasive Floors. Maker's line of floors is described in catalog 1935. Includes terrazzo aggregate, cement floor aggregate, ceramic mosaic tile, and stair and floor tile. Tells where to use. 12 pages. Specs. *Norton Co.*

14 · Flooring. Features, specs, and color chart on greaseproof flooring in 4-page folder. Pocket folder on care of tile floors. Another pocket folder with tile color chart is in the package. *Tile-Tex Div., The Flintkote Co.*

15 · Floor Plate. Abrasive rolled steel plate is subject of form No. 3356. 8 pages. Suggests industrial applications for the anti-slip material. Gives fabricating data. Includes tables and photographs. *Alan Wood Steel Co.*

16 · Mastic Products. A 24-page condensed catalog briefs the company's line of asphalt-type products. Three 8-page bulletins (1-SR, 1-SR4, and 1-SR-5) give details on materials for plants. *The Flintkote Co.*

17 · Rolling Doors. Bulletins 72 and 10-AR describe and illustrate full line of rolling doors, including fire doors and steel grills. Pictures show how doors operate. Features and specs. *Kinnear Mfg. Co.*

18 · Asphalt Tile. Four kinds of asphalt floor tile are shown in a 12-page bulletin. Color charts, special characteristics, sizes, suggested uses. Brief architectural specs are also included. *Uvalde Rock Asphalt Co.*

19 · Floors. A pair of 4-page bulletins give you maker's story on acid- and alkali-proof floors. Application data, specifications. Tables showing materials requirements. *Nukem Products Corp.*

Turn to page B-36

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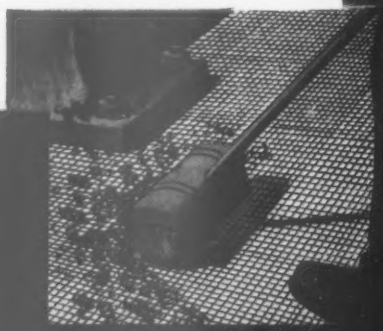
JAL-TREAD

for safe permanent flooring

Jal-Tread floor plate combines the strength and durability of high quality steel in an exclusive checkerboard pattern scientifically designed for *safety*.

Whatever your application . . . in new construction . . . new equipment . . . or replacement jobs, Jal-Tread will assure you of these advantages:

SAFE FOOTING—300 miniature squares per square foot—all of uniform height—provide maximum linear friction surface that protects you against lost time accidents.



EASY CLEANING—Jal-Tread's straight line gutter pattern permits quick, thorough sweeping and draining in any direction.

EASY FABRICATION—Jal-Tread's straight line pattern simplifies welding, flanging, shearing, bending, punching, and drilling operations. Experience shows that Jal-Tread can be cold-formed on standard plate bending machines

ATTRACTIVE APPEARANCE—Jal-Tread's exclusive checkerboard pattern gives a distinctive, neat appearance in all its applications.

For safe, long-lasting flooring, specify J&L Jal-Tread . . . the only true checkerboard floor plate.

Available at leading distributors everywhere

Jones & Laughlin

STEEL CORPORATION — *Pittsburgh*

J&L STEEL

COMPARE FLOODLIGHT FEATURES

TYPE L-69

FEATURE	G.E. L-69	Mfr. A	Mfr. B	Mfr. C	Mfr. D
TEMPERED GLASS SPUN TO REFLECTOR Reflector stays cleaner	YES	YES	YES	NO	NO
ALL PARTS CORROSION RESISTANT Floodlight lasts longer	YES	NO	NO	NO	NO
RELAMPING FROM REAR More convenient—reduces breakage	YES	YES	NO	YES	NO
ACCURATE BEAM SIGHTS Makes aiming easier	YES	NO	NO	NO	NO
CABLE FURNISHED Faster installation—no extra costs	YES	YES	YES	NO	NO
SERVICED WITHOUT TOOLS Faster, easier maintenance	YES	NO	NO	NO	NO

Almost any floodlight will perform satisfactorily when new. Only a top quality light will maintain this performance. If you want a floodlight which is easier to install and service, and which maintains its high light output after years of operation, install the General Electric L-69 floodlight.

More information on the L-69 floodlight is available from your G-E Distributor, or write General Electric Co., Section 451-188 Schenectady 5, New York.

GENERAL ELECTRIC

WORK and TRUCK on Vina-Lux FLOORS

The New Vinyl Flooring All America Is Talking About!

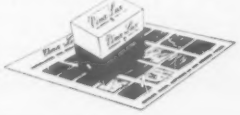
WHEN YOU WORK on Vina-Lux, you work without worry about spilled oil and grease — the dropping of heavy tools or parts. Abuse and impact resistance is built into Vina-Lux.

WHEN YOU TRUCK on Vina-Lux, you appreciate its remarkable wearing qualities — its ability to take heavy rolling loads constantly without deterioration.

WHEN YOU CLEAN Vina-Lux floors, you realize how simple and economical they are to maintain. Its tight, super-smooth surface refuses to absorb dirt — needs no waxing.

WHEN YOU VIEW your safety record with Vina-Lux floors, you'll praise its non-slip surface that makes it safer to walk or to work on — you'll appreciate its easy-on-the-feet comfort.

WHEN YOU EXPAND your facilities, you'll save money, because Vina-Lux tile by tile installation readily permits relayout of plant area with a minimum loss of valuable manufacturing time.



See your nearest Azrock flooring contractor for samples of Vina-Lux or write us for color chart and samples.

AZROCK FLOORING PRODUCTS

UVALDE ROCK ASPHALT COMPANY

FROST BANK BUILDING • SAN ANTONIO, TEXAS

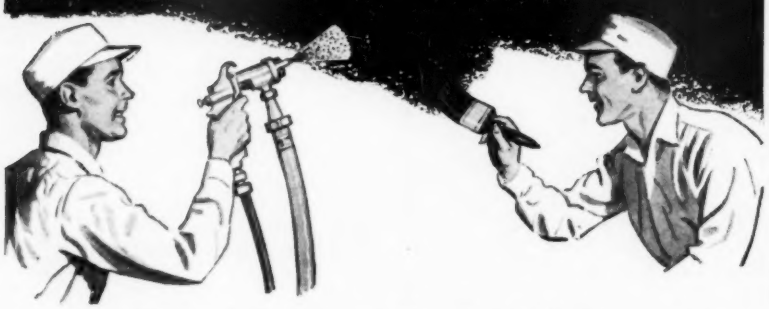
Makers of AZROCK Asphalt Tile, AZPHLEX Thermoplastic Tile, VINA-LUX Reinforced Vinyl Tile, DURACO Industrial Tile

Azrock Floor Products Serve Industry

STOP RUST and CORROSION,

Eliminate Maintenance Waste

WITH NoDrip® PLASTIC COATING



If you have a condensation problem, here is the inexpensive way to solve it, and at the same time *actually cut plant operating costs three ways!*

1. **NoDrip *eliminates* cost of painting and maintenance.**
2. **NoDrip protects and lengthens life of metal equipment and other installations.**
3. **NoDrip makes *idle* space usable.**

NoDrip forms a *permanent*, seamless, sealed jacket around tanks, pipes, vats, on walls, ceilings, air ducts and other metal installations. NoDrip is easy to apply with brush, trowel or spray.

Let NoDrip solve your condensation problem. For full details, send coupon today for your free copy of the NoDrip plant data Handbook. It will show how *your* problem can be solved, and what it can mean in actual plant operating savings!

JW Mortell COMPANY

Technical Coatings for Home and Industry

SINCE 1895

Detroit, Mich. KANKAKEE, ILL. Lyndhurst, N. J.

SEND COUPON TODAY!

J. W. MORTELL CO.
585 Burch St., Kankakee, Ill.
Please send my FREE copy of the NoDrip Data Handbook.

Name_____

Company_____ Title_____

City_____ Zone____ State_____

NEW FREE CATALOGS

Begins on page B-28

20 · Heavy-Duty Floors. Emery aggregate is the floor material described in Bulletin 653. Compression and tensile rating charts illustrate properties. Suggested applications. Recommended specs. *Walter Maguire Co.*

21 · Floors. Helps you solve floor problems. Tells why wood, concrete, and other types of floors deteriorate. Gives you tips on maintenance for each type of floor. Lists maker's products. 26 pages. *The Tremco Mfg. Co.*

22 · Concrete Floors. Cites advantages of maker's "iron-clad" concrete floors over ordinary concrete floors. Specifications, other useful data. Shows typical installations. Tells how floors are applied. 24 pages. *The Master Builders Co.*

23 · Air Construction Tools. Two 8-page bulletins (PBI and ST-100) give features and specs of pneumatic paving breakers, clay spaders, trench diggers, and backfill tampers. Application information. *Gardner-Denver Co.*

24 · Steel Doors and Windows. Here's a 36-page illustrated catalog (BSW 54) describing line of doors and windows. Includes layouts and sizes, specifications, and complete installation details. *William Bayley Co.*

25 · Overhead Doors. Folder No. S-53 has individual sections on wood and metal doors, track classifications, jamb construction, types of counterbalance, electric operation. 12 pages. Specs. *Overhead Door Corp.*

26 · Plywood Doors. A 4-page folder tells about maker's solid-core and hollow-core plywood doors. Pictures of installations.

Turn the page

To get these catalogs, circle item numbers on the Reader Service card next to back cover.

Make Your Walking Surfaces *Safe*

NON-SLIP, WET OR DRY

IN THE OFFICE

ALUNDUM® AGGREGATE
in Terrazzo

Provide attractive appearance as well as safety — throughout the office — in all areas where ordinary floors would be slippery, especially when wet. Use terrazzo made non-slip by ALUNDUM® Aggregate in the entrance lobby, in hallways, stairs, washroom, cafeterias and countless other places.

IN THE PLANT

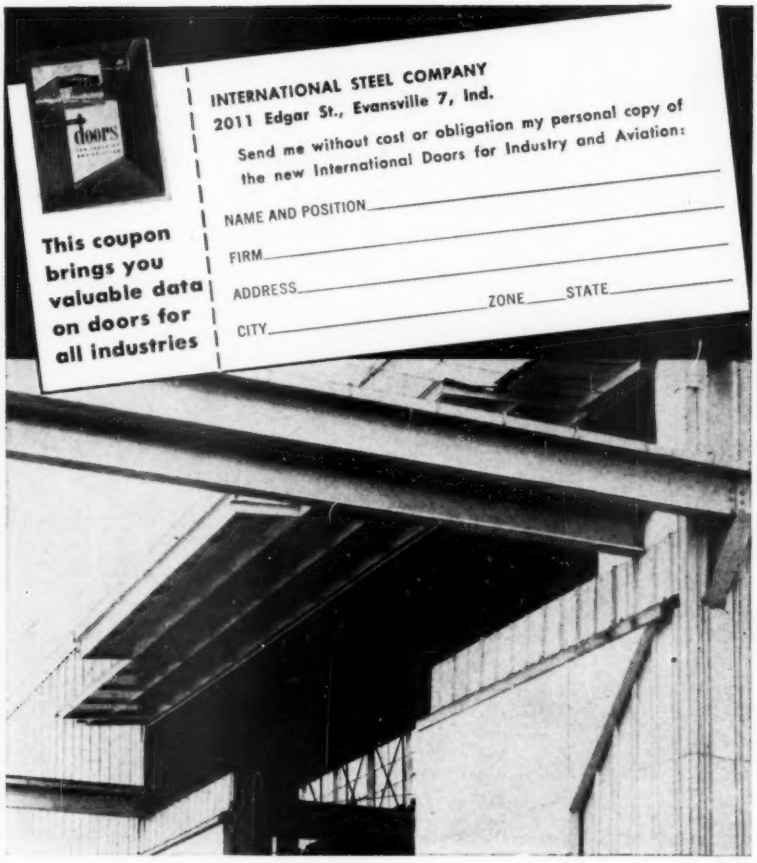
ALUNDUM® AGGREGATE
in Cement

Give your factory floors maximum resistance to wear as well as a surface that is non-slip wet or dry. ALUNDUM® (C.F.) Aggregate in cement is ideal for floors, stairs and ramps wherever there is heavy traffic — foot or truck. Ideal for use in areas where water would make ordinary floors slippery.

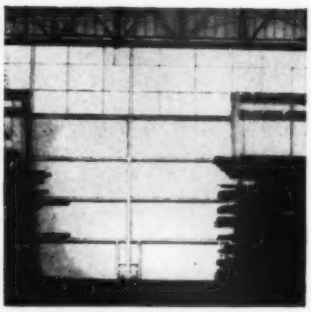
Send for Catalog 1935-F

NORTON COMPANY
WORCESTER 6, MASS.

T505


INTERNATIONAL STEEL COMPANY
2011 Edgar St., Evansville 7, Ind.
Send me without cost or obligation my personal copy of the new International Doors for Industry and Aviation:
NAME AND POSITION
FIRM
ADDRESS
CITY
ZONE
STATE
This coupon brings you valuable data on doors for all industries

ANY TYPE... ANY SIZE DOOR ... An International Specialty



Interior view of International Crane Door installation, built for steel warehouse service.

THIS KING-SIZE MOTORIZED CRANE DOOR — with an over-all area of 350 square feet and each square foot weighing a full 100 pounds — is the kind of project that can be a problem without the benefit of experienced planning help. In this case, the big 17½-ton crane door was completely engineered as well as fabricated by International Steel.

In all cases, International's all-inclusive service . . . from sitting in at the planning stage to actual fabrication and erection . . . is yours to use, any time and any part, in speeding any industrial door problem to a profitable solution. International's experience is all-inclusive, too — covering every type of door for in-plant or outside applications. You'll find this confirmed in the valuable handbook offered in the coupon above. Send for your personal copy *today*.

INTERNATIONAL SERVICE

2011 EDGAR STREET EVANSVILLE 7, INDIANA

INTERNATIONAL STEEL COMPANY

NEW FREE CATALOGS

Begins on page B-28

Sizes and measurements. Construction features suggest applications. *Atlas Plywood Corp.*

27 · Overhead Doors. You'll find information on several types of overhead doors in Catalog No. 21, an 8-pager. General specifications are included. Diagrams showing construction details and how doors work. *McKee Door Co.*

28 · Steel Deck. Tells how to use steel deck for roofs, sidewalls, partitions, ceilings, and floors. Installation data. You'll find photographs, tables and diagrams. 16 pages. Catalog No. B-54-A. *The R. C. Mahon Co.*

29 · Steel Doors. Line of rolling doors, grills, and shutters is presented in Catalog No. G-54. 16 pages. Diagrams of each type. Tables give all clearance dimensions. Specifications are included. *The R. C. Mahon Co.*

30 · Steel Sheet Piling. Gives comparative data on maker's steel sheet piling, cites advantages of renting piling materials. Tells how you can estimate amount of piling needed for job. 20 pages: No. 575-D. *L. B. Foster Co.*

31 · Door Controls. File folder tells how maker's door operators can help you cut costs. Four case studies illustrate applications in a variety of industries. Illustrates automatic and semi-automatic types of door controls. *Stanley Works.*

32 · Sliding Door Hardware. This 40-page catalog (No. 200) illustrates a full line of hardware for sliding doors. Specs, application data, index. Sections on brackets, hangers, and tracks are also included. *Wickwire Spencer Steel Div.*

Turn the page

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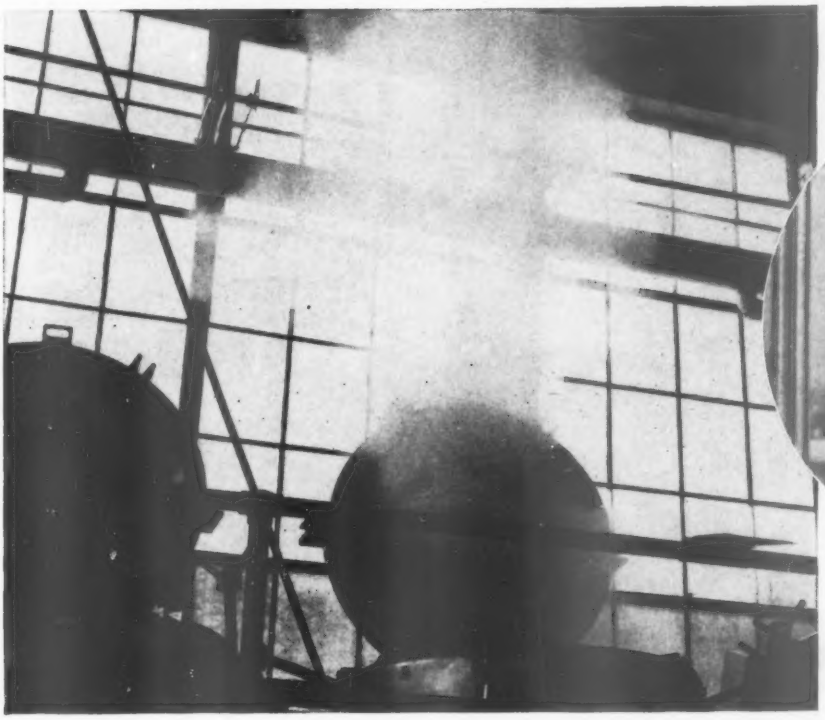
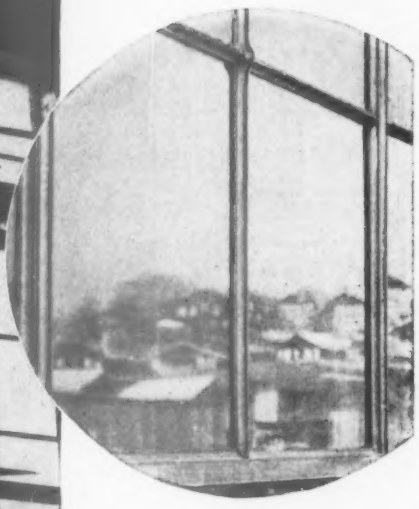
Fenestra 50 YEARS OF BUILDING PRODUCT LEADERSHIP

"A salute to those who made it possible" *





Fenestra Steel Windows have spent 23 years in this cooking room of Wm. Underwood Co., Watertown, Mass. Close-up is unretouched.

How to make a habit of saving $3,600

Despite 23 years of steam-dousing, the galvanized Fenestra* Steel Windows in this "cooking" room have never rusted.

Now Fenestra offers you *Super* Hot-Dip Galvanized Steel Windows *that cost no more than regular steel windows with two inside-outside field coats of paint!* And these windows *never need painting.* That's a saving of over $3,600 in paint and painting labor—every few years—for the life of your building . . . if yours is an average-sized plant.

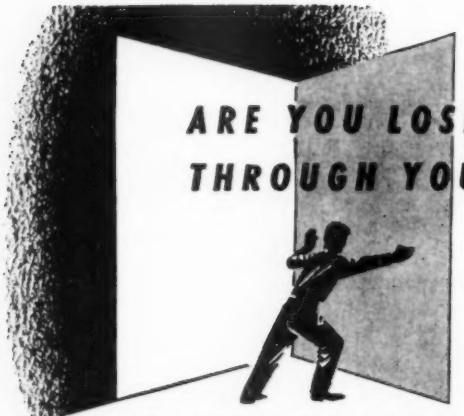
Fenestra has the only plant and equipment in America especially designed for the tricky job of window galvanizing. For details on Fenestra Super Hot-Dip Galvanized Steel Windows, call your Fenestra Representative listed in the phone book yellow pages—or write Detroit Steel Products Company, Dept. FM-6, 2266 E. Grand Blvd., Detroit 11, Michigan.

*®

BEND TEST shows why Fenestra Steel Windows are called Super Hot-Dip Galvanized. When two pieces of galvanized steel are bent, then straightened, some types of galvanizing crack open, leaving the steel vulnerable. The Fenestra piece stays protected.

* Your desire for windows of strong material that would resist rust, resulted in Fenestra Super Hot-Dip Galvanized Steel Windows—a great advancement.

Fenestra | SUPER HOT-DIP GALVANIZED STEEL WINDOWS



ARE YOU LOSING PROFITS THROUGH YOUR DOORS?

YOU ARE IF MANPOWER OPENS THEM

Figure the costly materials' handling time wasted daily in your plant through busy manually-operated doors: *To get through such a door, a worker must stop and leave his truck . . . open the door . . . return to the materials . . . then pass through the door. Finally, to save conditioned air, he must return to close the door before going on.*

Add heat waste, door and equipment damage and decreased worker morale to those unproductive man-hours. They total up to a staggering profit loss!

STANLEY

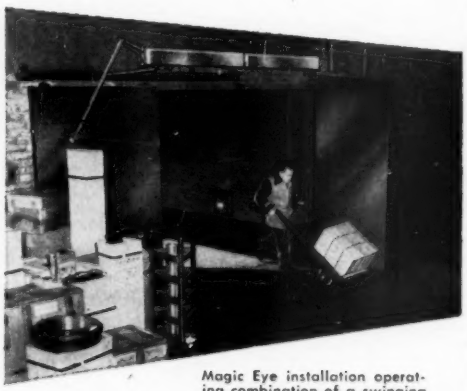
Magic Door **CONTROLS SPEED UP TRAFFIC and LOWER COSTS**

MAGIC EYE
(Photo-electric). Actuates door when beam is broken.

PUSH PLATES
Wall-mounted push or kick plates. Adaptable to many industrial locations.

PULL CORD
Door is operated only with pull of overhead hand cord.

MAGIC CARPET
For pedestrian traffic only. Ideal for office use.



Magic Eye installation operating combination of a swinging and a sliding door at White Motor Co. Plant, Cleveland, Ohio.

Here, you can see how WHITE MOTOR CO., Cleveland, Ohio, licked the problem in one of their departments of simultaneously opening a combination swinging and sliding door, easily and economically. By automatically opening and closing office, plant, or warehouse doors with Stanley Magic Door Controls, you too can save time, labor, and money.

One of the controls illustrated could be custom-engineered to ANY door or combination of doors that swing, slide or fold, in your plant. Made for years of dependable service . . . designed for minimum maintenance . . . Stanley Magic Door Controls are the practical answer to your materials' handling problems.

Send the coupon for the name of the Stanley Field Technician nearest you. He will be glad to show you how automatic Stanley Magic Door Controls will increase your productive man-hours . . . boost profits!

STANLEY ®
Magic Door **CONTROLS**

REPRESENTATIVES IN PRINCIPAL CITIES

MAGIC DOOR DIVISION, The Stanley Works
1006 Lake Street, New Britain, Conn.

( ) *Please send full information on Stanley Magic Door Controls.*
( ) *Have Field Technician call.*

Company Name_____

My Name_____ **Title**_____

Company Address_____

City_____ **Zone**_____ **State**_____

STANLEY TOOLS • STANLEY HARDWARE • STANLEY ELECTRIC TOOLS • STANLEY STEEL STRAPPING • STANLEY STEEL

NEW FREE CATALOGS

Begins on page B-28

33 · Doors. Here's a series of 13 illustrated pamphlets on a line of overhead, sliding, and swinging doors; swinging gates; and door operators. Suggestions on how and where to use each. Specs. *Barber-Colman Co.*

34 · Built-up Roofs. How to apply roof reinforcing is one subject covered in an 8-page bulletin. Another 4-page bulletin deals with roof insulation. Uses, specs., heat transfer tables are included. *Owens-Corning Fiberglas Corp.*

35 · Roof Deck. You'll find facts about maker's line of aluminum roof deck in this 12-page catalog. Drawings show how to select and install it properly. Engineering data and specifications. *Reynolds Metals Co.*

36 · Heat - Absorbing Glass. Maker's product is fully described in this 14-page catalog. Schematics show how glass intercepts sun's heat. Specs. Installation instructions. Application data. *Mississippi Glass Co.*

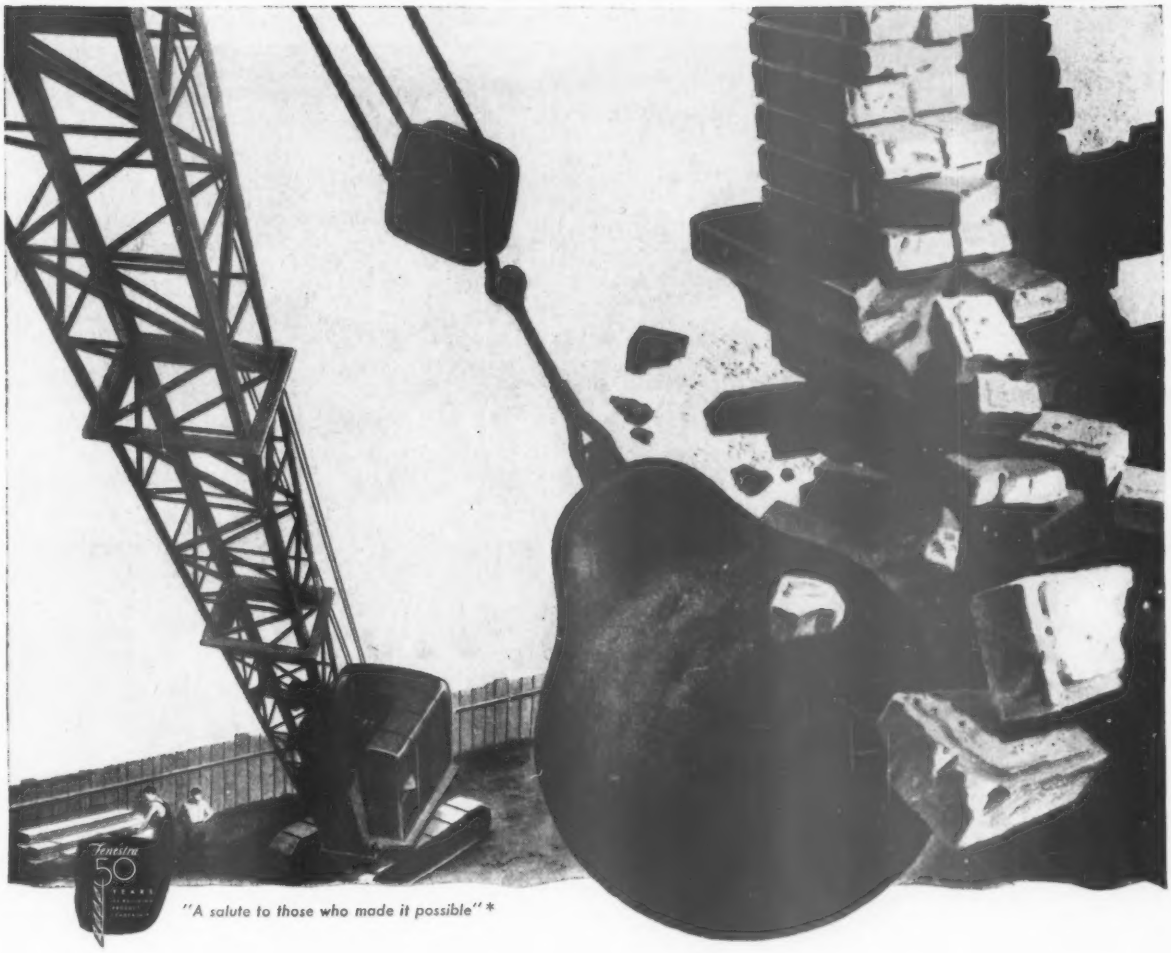
37 · Built-up Roofing. A 32-page bulletin covers coal tar pitch roofing, waterproofing, dampproofing, roof insulation, flashings, and protective coatings. Detailed specs. *Koppers Co.*

38 · Roofs. "Solving Roof Problems" is the title of a 34-page bulletin. You'll find facts and photos on installing roofs, diagnosing troubles, and making repairs. *The Tremco Mfg. Co.*

39 · Automatic Doors. "How automatic doors can save you money and manpower" is title of this 8-pager. Lists features and advantages, suggests applications, describes and illustrates installations. *National Pneumatic Co.*

Turn to page B-44

To get these catalogs, circle item numbers on the Reader Service card next to back cover.



"A salute to those who made it possible" *

WILL YOUR BUILDING DIE OF ELECTRICAL STARVATION?

Will it be old *electrically* before it's completed?

Or will it be productive beyond its normal span because of its electrical flexibility? It *can be*—with Fenestra-Nepco Electrifloor—the structural floor system in which the sheet steel cells are used as electrical raceways.

With this advanced new floor system, new outlets can be installed *any time* . . . in *any* or *every* square foot of floor space. Your floor will welcome every future electrical demand.

And this new floor system saves building time, labor, materials and money!

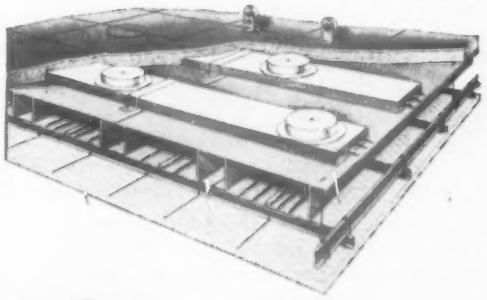
On one job, 1,000 tons of structural steel were saved because of Electrifloor's combination of great strength with light weight. Foundation costs were also cut.

On a rush job, it saved 6 months' building time—as many as 7 floors went in at once. As soon as a few of the cellular floor panels were laid and interlocked, they served as material storage space and working platform.

Fenestra-Nepco Electrifloor was developed jointly by Fenestra* (Detroit Steel Products Company) and Nepco (National Electric Products Corporation)—two great names in the construction field.

If *you* want to protect *your* building investment write to Detroit Steel Products Co., Dept. FM-6, 2266 E. Grand Blvd., Detroit 11, Mich.

*Trademark



* Your need for electrical flexibility for the present and future of your building encouraged Nepco and Fenestra to develop Electrifloor . . . a great advancement in building products.

Fenestra Nepco | ELECTRIFLOOR

A WELDER'S TORCH STARTED *BOTH* OF THESE *FIRES*

One was the biggest single plant fire in history. Touched off by sparks from a welding torch, it took three lives, injured thirteen, and destroyed a relatively new $35,000,000 "noncombustible" building.

The fire at the Meier & Pohlmann Furniture Company plant, St. Louis, Mo., started the same way. Sparks from a welder's torch . . . ignited highly flammable lacquer fumes. Why didn't this plant *too* go up in smoke? A Grinnell Automatic Sprinkler System extinguished most of the flames before firemen arrived.

Most fires start small. They can be brought under control if properly attacked within the first few minutes. Grinnell Sprinklers stop fire at its source, wherever and whenever it strikes, night or day, with *automatic* certainty. Seventy-six years experience proves this.

Remember, a Grinnell System often pays for itself in a few years through reductions in insurance premiums. So if you have fire insurance, you are probably paying for Grinnell Protection anyway . . . *why not have it!*

A Grinnell engineer will gladly advise you on the proper Grinnell System to protect *your* property. Write Grinnell Company, Inc., 262 West Exchange Street, Providence, Rhode Island.

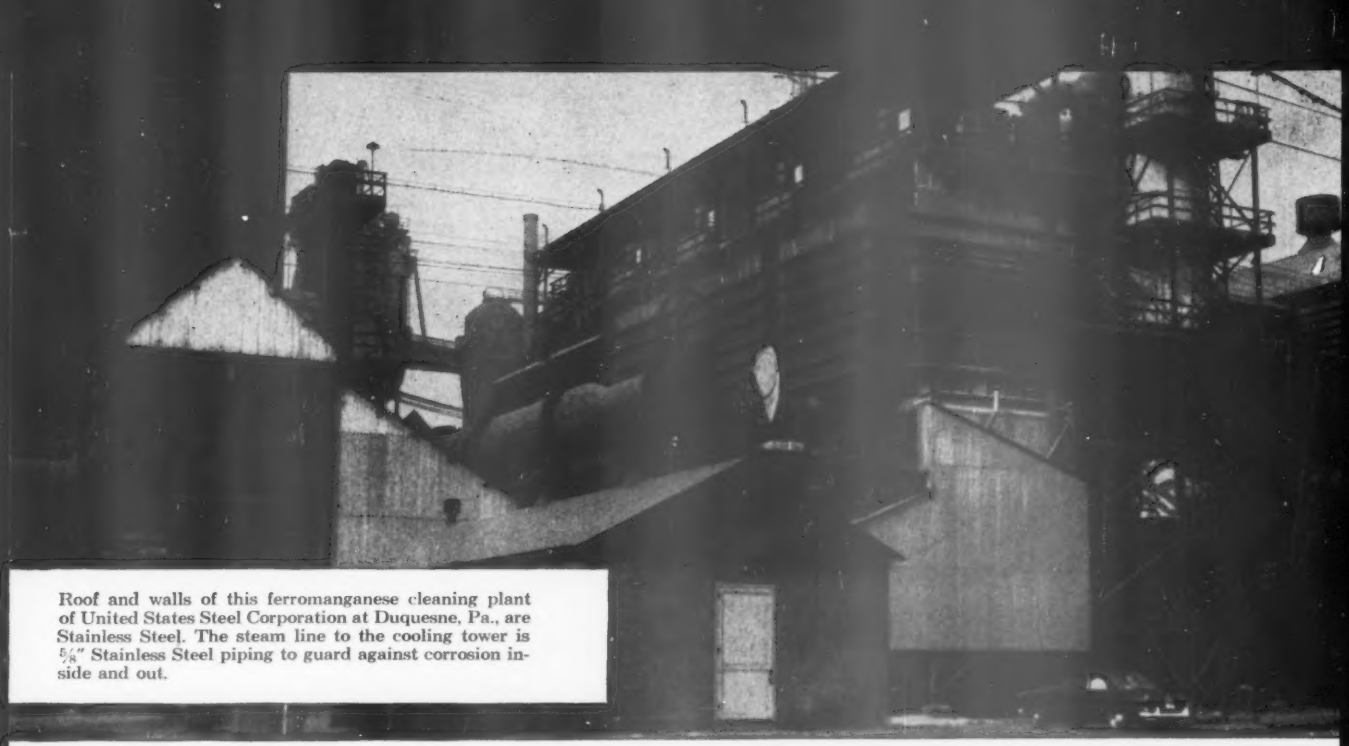
HERE IS A PARTIAL LIST OF THE DIFFERENT FIRE PROTECTION SYSTEMS WHICH GRINNELL CAN ENGINEER TO FIT *YOUR* PARTICULAR NEED . . .

- ***Wet-Pipe "Spray" Sprinkler System.*** Where temperatures remain above freezing.
- ***Dry-Pipe "Spray" Sprinkler System.*** Where temperatures may go below freezing.
- ***Multitrol System.*** For faster application of water in extra hazardous areas.
- ***Textile Opener Room System.*** For flash fires in opened cotton bales.
- ***Mulsifyre System.*** For fires in heavy as well as in medium oils.
- ***ProtectoSpray System.*** For fires in light and medium oils — many special hazards.
- ***ProtectoFoam System.*** For fires in gasoline and other highly flammable liquids.
- ***Fire Protection Specialties.*** Window sprinkler, sprinkler guard, fusible links.

GRINNELL

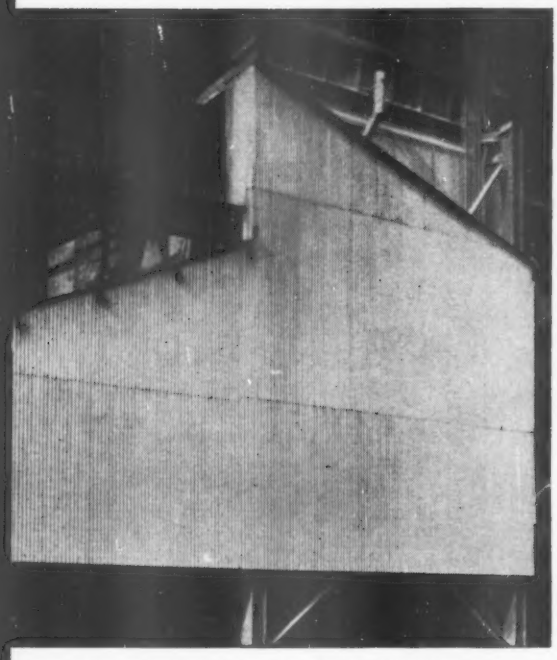
PROTECTION AGAINST EVERY FIRE HAZARD

Manufacturing, Engineering and Installation of Automatic Sprinklers Since 1878



Roof and walls of this ferromanganese cleaning plant of United States Steel Corporation at Duquesne, Pa., are Stainless Steel. The steam line to the cooling tower is 5/8" Stainless Steel piping to guard against corrosion inside and out.

Built for *maximum* resistance to gases, dirt and moisture with STAINLESS STEEL roof and walls



A closer view of the wall of the plant shows how the 24-gage corrugated Stainless Steel siding is applied.

By the very nature of its purpose, this building is going to take a beating. It houses a battery of electrostatic precipitators to clean gas from ferromanganese blast furnaces at Duquesne Works of United States Steel Corporation.

Ferromanganese cleaning involves much corrosive dust and fumes, in addition to the moisture and dirt generally found in industrial atmospheres. To give the building maximum life, it was constructed with a roof and walls of U·S·S Stainless Steel.

The Stainless Steel was used in the form of 24-gage corrugated sheets. Fastening hardware and flashing are Stainless Steel too.

In addition to their superior corrosion resistance, Stainless Steel walls and roofs offer many other advantages in industrial buildings. Erection is fast and goes forward in all kinds of weather. Maintenance is at a minimum with no painting required. And, of course, the life of the building is extremely long.

Give your buildings—warehouses, power plants, manufacturing facilities and even office structures—this long, maintenance-free life by specifying U·S·S Stainless Steel. If you would like more information on this type of construction, mail the coupon below.

United States Steel Corporation
Room 4349, 525 William Penn Place
Pittsburgh 30, Pa.

Please send me literature on Stainless Steel walls and roofs for industrial buildings.

Name ..... Title .....

Address .....

City ..... State .....

UNITED STATES STEEL CORPORATION, PITTSBURGH · AMERICAN STEEL & WIRE DIVISION, CLEVELAND · COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO
NATIONAL TUBE DIVISION, PITTSBURGH · TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA. · UNITED STATES STEEL SUPPLY DIVISION, WAREHOUSE DISTRIBUTORS
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

U·S·S STAINLESS STEEL

SHEETS · STRIP · PLATES · BARS · BILLETS · PIPE · TUBES · WIRE · SPECIAL SECTIONS

USS

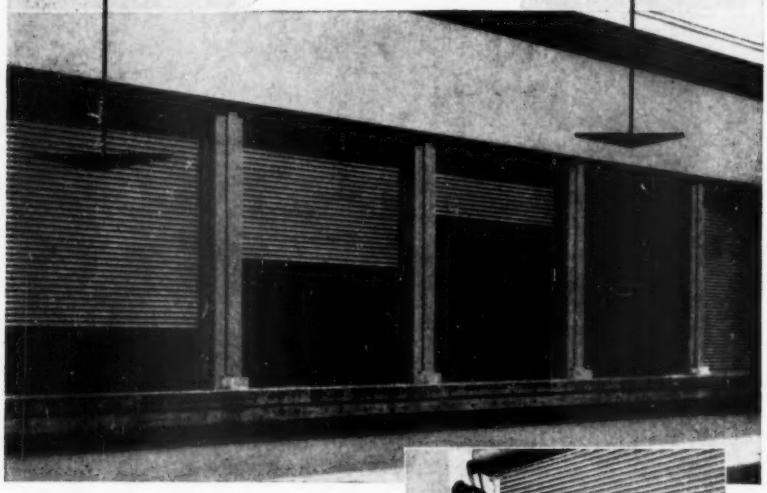
4-202

UNITED STATES STEEL

Interlocking steel-slat construction assures extra protection and longer life at lower cost*

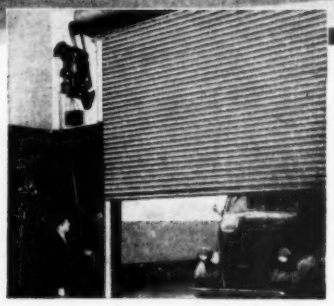
Kinnear Steel Rolling Doors

Smooth coiling upward action makes all floor and wall space fully usable at all times



With Kinnear Rolling Doors, all overhead space remains clear for hoist, crane or conveyor equipment or other superstructure. No floor or wall space is lost *inside or outside* of Kinnear Rolling Doors because they open straight upward. Light from overhead fixtures is never obstructed.

Kinnear Rolling Doors coil compactly, directly over the door lintel. Edges of the steel curtain are securely anchored in tracks from floor to lintel, insuring secure closure and extra protection against fire, intrusion and the elements. Kinnear's smooth upward action assures easy manual lift, chain or crank operation, and is ideal for time-saving electric control, using Kinnear Motor Operators with push-buttons at any number of convenient points. Kinnear Rolling Doors are built any size . . . easily installed in old or new buildings. Write today for full details.



*DOUBLE PROTECTION AGAINST THE ELEMENTS

Kinnear Steel Rolling Doors are heavily galvanized (1.25 oz. of zinc per sq. foot, as per ASTM standards) to provide a long-lasting weather-resistant surface. In addition Kinnear Paint Bond, a special phosphate application, provides for easy, thorough paint coverage and lasting paint adhesion.

Records show that many Kinnear Rolling Doors have been in continuous service for 20, 30 and 40 years.

KINNEAR ROLLING DOORS
Saving Ways in Doorways

The KINNEAR Manufacturing Co.
FACTORIES:
1540-60 Fields Avenue, Columbus 16, Ohio
1742 Yosemite Ave., San Francisco 24, Calif.
Offices and Agents in All Principal Cities

NEW FREE CATALOGS
Begins on page B-28

40 · Built-up Roofs. A 126-page file folder. Covers pitch-and-felt, asbestos, mineral-surfaced, and traffic-type roofs. You'll find construction details and applications in this package. Photos. Drawings. *The Ruberoid Co.*

41 · Roof Trusses. "Timber" is the title of this useful 20-page booklet. Photos show use of wood roof truss frames in wide variety of buildings. Lists roof truss fabricators for your reference. *Timber Engineering Co.*

42 · Roof Supports. This 20-page booklet covers arches, beams, and trusses of glued laminated wood. Photos, drawings, and tables show applications, specs, and dimensions for the roof supports. *Rilco Laminated Products, Inc.*

43 · Steel Walls and Roofs. You'll read about two kinds of stainless steel building panels in this 18-page catalog. Diagrams, specifications, construction details, comparative costs. Applications, too. *U. S. Steel Corp.*

44 · Metal Walls. A 12-page catalog (No. B-54-B) with a 3-page insert gives advantages of maker's insulated metal walls and prefab panels. Specs and construction details. Where-to-use data, too. *The R. C. Mahon Co.*

45 · Rock Wool Insulation. How to use poured and loose wool, sealed blankets. Tells how much insulation is needed by different types of buildings. Form A1767. 22 pages. Charts. Drawings. *National Gypsum Co.*

46 · Fire - Retardant Wood. You'll find specs in Form G-28 for treating wood to make it fire-retardant. Also case studies and pictures of burning tests with

To get these catalogs, circle item numbers on the Reader Service card next to back cover.

© GF Co. 1954

Here's how to store "non-productive" stock

The GF Control System, using **GF STEEL SHELVING, RACKS AND BINS,** *reduces handling; cuts inventories; saves time, money*

YOUR STOCKROOM should be as carefully controlled as your cash box! If you can't lay your hands on maintenance and "housekeeping" supplies without long search and extra steps...or if they run out through lack of proper inventory control ...*it costs you time and money!*

PERFECT CONTROL IS SIMPLE. We have prepared a booklet (*free if you write for it on your company letterhead*) titled: "Non-Productive Stock—Its Storage and Handling". In it is a scientific control system that will save you important dollars where you'd least expect to find them.

DESIGNED FOR ECONOMICAL EFFICIENCY. GF steel shelving, bins, racks and cabinets are expressly designed for systematic storage of all maintenance and replacement items for plant, factory or office. GF steel units can be *combined* as you wish, *moved* as you wish.

MADE STRONG TO LAST LONG. Made of toughest steel, GF shelving gives you more strength with less bulk. Cannot warp, split or rot...and it lasts so long it pays for its low initial cost many times over.

* * *

WE REPEAT...send for our FREE booklet, "*Non-Productive Stock — Its Storage and Handling*". No obligation on your part. Address: The General Fireproofing Company, Dept. D-31, Youngstown 1, Ohio.

GF

GENERAL FIREPROOFING

Foremost in Metal Business Furniture

MODE-MAKER DESKS • GOODFORM ALUMINUM CHAIRS • SUPER-FILER MECHANIZED FILING EQUIPMENT • GF ADJUSTABLE STEEL SHELVING

Good metal business furniture is a good investment

INSURANCE SAVINGS ALONE

will pay for an

ALGRIP

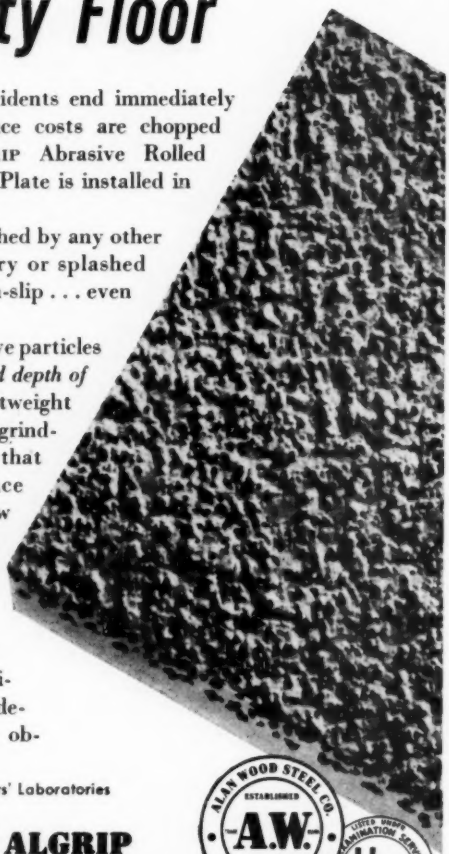
Safety Floor

Slipping accidents end immediately and insurance costs are chopped when ALGRIP Abrasive Rolled Steel Floor Plate is installed in any plant.

ALGRIP's safety is unmatched by any other material because wet, dry or splashed with oil, ALGRIP *stays* non-slip . . . even on steep inclines.

Hundreds of tiny abrasive particles impregnated *to a controlled depth of penetration* into tough, lightweight steel plate give ALGRIP a "grinding-wheel" grain surface that never wears smooth since hard use only exposes new gripping particles . . . an exclusive ALGRIP feature.

ALGRIP foot safety actually costs nothing, because it pays for itself in savings on insurance premiums. Write today for full details. There's no cost or obligation.



ALGRIP is Underwriters' Laboratories approved for safety.

A.W. ALGRIP
Abrasive Rolled Steel Floor Plate

ALAN WOOD STEEL CO. ESTABLISHED A.W. 1826 CONSHOHOCKEN, PA.

LISTED UNDER EXAMINATION SERVICE UNDERWRITERS' LABORATORIES, INC. UL

ALAN WOOD STEEL COMPANY
CONSHOHOCKEN, PA.

Please Send Booklet AL-27 on how ALGRIP can cut costs and stop accidents.

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Address_____

City_____ Zone_____ State_____

treated and untreated wood. Suggests applications. 12 pages. *Koppers Co.*

47 · Insulation. Three catalogs (Forms A91, A108, A290) tells about maker's insulating materials. Range from mineral wool to fireproofing cement. Features and specifications. Suggested applications are included. *Eagle-Picher Co.*

48 · Asbestos Sheets. Full line of corrugated sheets for roofs and sidewalls is described in a 32-page booklet. Dimensions and weights included. Pictures show application methods. Form No. 1297. *The Ruberoid Co.*

49 · Insulation Board. Describes line of panels, planks, tiles, sheathing, and roof boards. Tells how to install them and where they can be used. Also has section on hardboard products. 18 pages. Form B48. *National Gypsum Co.*

50 · Acoustical Ceilings. You get facts on five acoustical ceiling materials in Form 649. Specs give noise reduction coefficients. Drawings show different ways to apply materials. 16 pages. *National Gypsum Co.*

51 · Ventilating Domes. A 4-page folder describes roof domes that give daylight and ventilation. Construction features and complete specifications. Chart shows how many ventdomes you'll need. *Wasco Flashing Co.*

52 · Metal Framing. Catalog No. 700 covers line of all-purpose framing. Application and design data are included. 78 pages. Catalog No. 800 is reference pocketbook for any one using framing. 84 pages. *Unistrut Products Co.*

Turn the page

➤ To get these catalogs, circle item numbers on the Reader Service card next to back cover.

CUT BUILDING COSTS

with RUBEROID Corrugated Asbestos Sheets

Skeleton construction with Ruberoid Corrugated Asbestos Sheets can save you money.

When used as siding and roofing over skeleton framework, these strong sheets permit lighter footings, foundations and framework.

Besides being fireproof, weatherproof and non-corrosive, Corrugated Asbestos Sheets eliminate the cost of painting and maintenance. They are used extensively in chemical plants, oil refineries and other places where the destructive effects of acids, fumes, smoke or steam are extreme. At the same time they are being used with pleasing effects for office walls, lobbies, display centers, etc.

You can figure exactly how to use the virtues of corrugated sheets to best advantage with the aid of Ruberoid's Corrugated Asbestos Catalog. It contains specifications, assembly instructions and detail sketches. See AIA File No. 12-F, or write or call nearest district office listed below.

Engineering consulting service, including take-offs on request.

The RUBEROID Co.

Executive Offices: 500 Fifth Ave., New York 36, N. Y.

Asphalt and Asbestos Building Materials

DISTRICT SALES OFFICES

Baltimore 24, Md.	1500 So. Ponca Street
Chicago 1, Ill.	307 N. Michigan Avenue
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Millis, Mass.	Curve Street
Minneapolis 11, Minn.	50 Lowry Ave. North
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St. Louis 15, Mo.	9215 Riverview Drive
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Savannah, Georgia	P. O. Box 1183

MILCOR* Steel Roof Deck

The permanence of steel — in a roof that *goes up fast!*

Time is money on every building job! Milcor Steel Roof Deck gets operations under cover fast at low labor costs, gives ideal base for permanent roofs.

Milcor Roof Deck offers cost-cutting advantages you can't afford to overlook:

1. It can be erected anytime — in any weather a man can work.
2. It is light in weight — finished roof requires less costly supporting structures.
3. It is versatile — can be used for flat, pitched, or curved roofs . . . sidewalks and partitions . . . or as permanent steel forms for concrete.

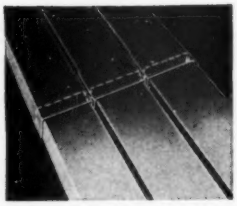
Milcor Steel Roof Deck provides additional advantages, also: High strength-to-weight ratio. Fire resistance. Low maintenance cost.

There are many durable, low-cost Milcor Roof Deck installations now in service throughout the country — on auditoriums, field houses, factories, office buildings, hotels, apartment houses, hospitals, and schools.

For help in using Milcor Steel Roof Deck efficiently, see the Milcor Manual. Write for your copy. And — call on our engineering service for assistance on your special problems.

M-1318

Milcor Steel Roof Deck is quickly attached to any structural member by welding. Clips can be furnished for anchoring the deck, when welding facilities are not available or if purlins are wood.



Unique design permits sections to be nested and lapped quickly and easily. Plates interlock firmly, providing an unbroken roof surface that is adaptable to any degree of insulation.

*Reg. U. S. Pat. Off.

INLAND STEEL PRODUCTS COMPANY

4059 W. BURNHAM ST. • MILWAUKEE 1, WISCONSIN

BALTIMORE 5, MD., 5300 Pulaski Highway — BUFFALO 11, N. Y., 64 Rapin St. — CHICAGO 9, ILL., 4301 S. Western Blvd.—CINCINNATI 25, OHIO, 3240 Spring Grove Ave. —CLEVELAND 14, OHIO, 1541 E. 38th St.—DETROIT 2, MICH., 690 Amsterdam Ave.— KANSAS CITY 41, MO., P. O. Box 918 — LOS ANGELES 58, CALIF., 4807 E. 49th St. — NEW YORK 17, N. Y., 230 Park Ave. — ST. LOUIS 10, MO., 4215 Clayton Ave.

NEW FREE CATALOGS

Begins on page B-28

53 · Steel Windows. Here's a 24-page booklet about a line of industrial steel windows. Several different types are pictured and explained to help you select. Uses, advantages, specs. *Detroit Steel Products Co.*

54 · Window Maintenance. "Complete Sash Maintenance" is the title of this illustrated 18-page catalog. Shows how to lick specific window problems. Covers glazing, painting, caulking, rust prevention. *Tremco Mfg. Co.*

55 · Washroom Compartments. Catalog No. 91 shows a line of toilet compartments and shower stalls. Floor plans of available models, color card. Selection and installation data. 20 pages. *The Sanymetal Products Co.*

56 · Steel Lockers. Catalog No. EL-561 illustrates and describes complete line of lockers. Suggestions on ordering them, specifications, construction details, installation data. *Berger Mfg. Div., Republic Steel Corp.*

57 · Sewer Pipe. Where to use root-proof pipes and fittings. How they are assembled, installed, tooled, and jointed. Section on perforated pipe is also included. Catalog No. 306, 12 pages. *Orangeburg Mfg. Co.*

58 · Aluminum Windows. Specs and installation details in a 20-page bulletin (BAPW 54). Covers projected ribbon windows. Included are useful diagrams, tables, charts. *William Bayley Co.*

59 · Glass Block. Two 24-page catalogs give advantages and uses of glass block, tell how to install it. Table of dimensions. Construction details. Technical data and specifications. *Kimble Glass Co.*

Turn to page B-52

To get these catalogs, circle item numbers on the Reader Service card next to back cover.

SOLID STEEL

that keeps out intruders—yet lets in heat, light, sound and air

Here's the answer to a maintenance engineer's dream: rugged, easy-to-erect enclosures *stronger than solid steel its own weight*, yet open-meshed to allow full visibility and ventilation. What's the "wonder metal" that makes all this possible? *Wheeling Expanded Metal!* And it's all the more practical because the partitions, in standard panel sizes, install with screwdrivers and pliers.

Need grilles, bins, or walkways in *your* plant? Look into versatile Wheeling ExM, the metal of 1,001 uses. Write for full details.

WHEELING CORRUGATING COMPANY

WHEELING, WEST VIRGINIA

Atlanta Boston Buffalo Chicago Columbus Detroit
Houston Kansas City Louisville Minneapolis New Orleans
New York Philadelphia Richmond St. Louis

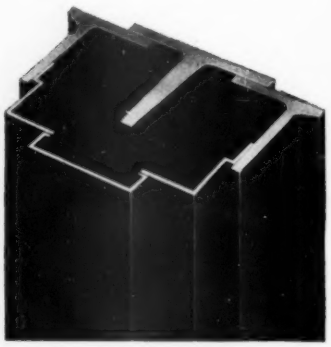
P. S. Wheeling also manufactures Expanded Metal in a variety of heavy gauges for use in reinforcing concrete and building construction. Write for full details.

*Visioneering** IN YOUR PLANT

Sturdy white bronze handles (approximately ⅔ actual size) attached with screws threaded in grommets embedded in the section.

Bayley-originated variable width adjustable Mullions and Mullion Cover

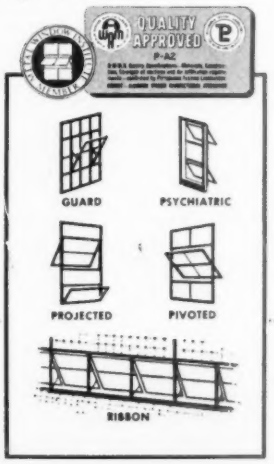
- Provides for contraction and expansion, insuring good contact at jambs
- Adjustable ½" plus or minus variation in masonry dimension
- Attractively conceals all bolts against corrosion hazard
- Provides two direction slip joint
- Lintel or building load do not bear on window—preventing distortion and assures proper ventilator operation
- Cost-reducing clip and bolt assembly
- Tight window and mullion fit, facilitates caulking



It's details like these---*that make* BAYLEY STEEL or ALUMINUM WINDOWS *your best buy in service-investment*

As the pioneer in the Metal Window Industry, Bayley has proved the ultimate worth in extra quality of construction details. That is why Bayley Windows exceed the usual standard in depth and weight of window sections; weight and design of operating parts; methods of fabrication and assembly . . . to assure the maximum ultimate economy that is so essential to a product that accounts for such a large percentage of a building's wall area. If you are interested in providing greater window operating efficiency with years of low maintenance cost, Bayley has a story for you that can be substantiated by user performance records. Write or call Bayley for window consultation on your new or modernizing program.

Write today for our idea packed window catalog



**Visioneering*—The science of coordinating vision, air and light in modern building walls with windows of advanced design.*

Bayley Visioneering Reflects 75 Years of Reliability

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THE WILLIAM BAYLEY COMPANY

Springfield, Ohio

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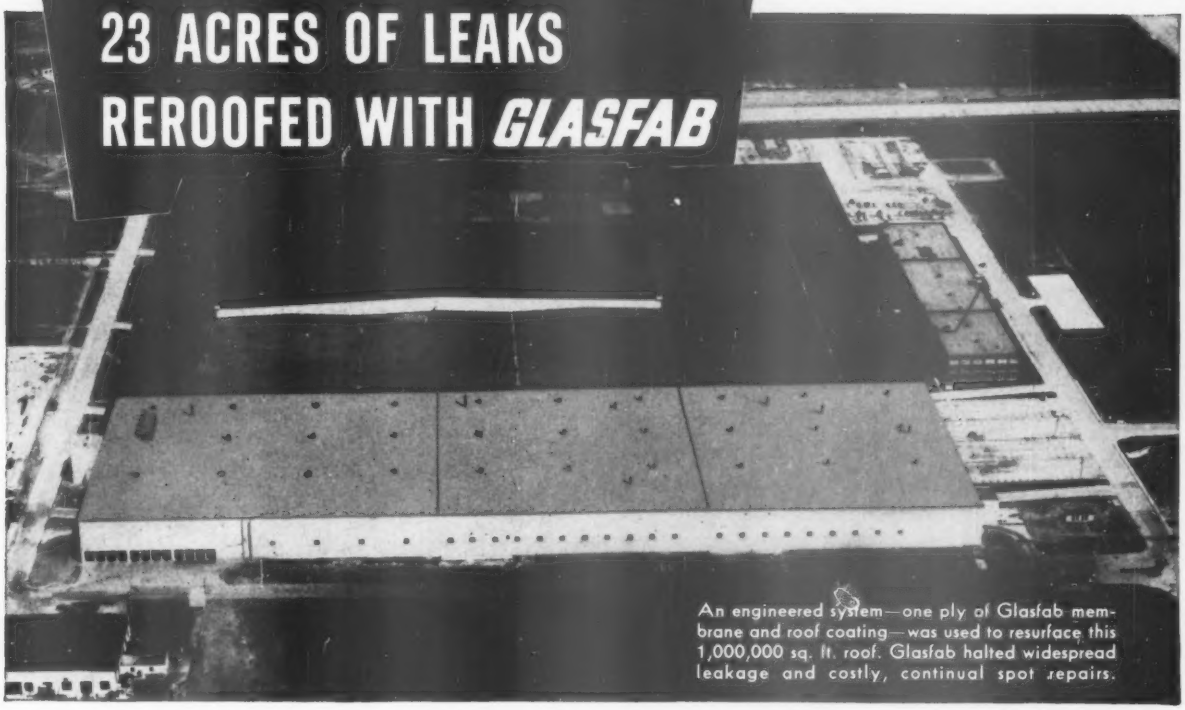
23 ACRES OF LEAKS REROOFED WITH *GLASFAB*



An engineered system—one ply of Glasfab membrane and roof coating—was used to resurface this 1,000,000 sq. ft. roof. Glasfab halted widespread leakage and costly, continual spot repairs.

Recently, 23 acres of leaks at a large midwestern tank arsenal were converted into dependable, water-tight roofing.

With the new *Glasfab system of roof maintenance.*

Cost of resurfacing this badly deteriorated roof with the Glasfab system was some 33⅓% less than a standard 3-ply application of asphalt-saturated roofing felts. A single-ply construction of Glasfab and asphalt coating assure 10 years' of trouble-free protection . . . with no recoating necessary.

Glasfab, the fiber glass roofing membrane, was selected to solve this difficult leakage problem because of its outstanding economy; simple, fool-proof installation; and positive, long-lasting results. Strong and virtually indestructible, Glasfab has an open-mesh weave which assures better reinforcement of roof coatings.

Glasfab produces a flexible roof surface that is tough and water-tight—and stays that way despite punishing roof traffic. Glasfab is available in lightweight, easy-to-handle rolls so that your own maintenance crew can install it. Or your roofing contractor will be glad to install Glasfab.

Your roof-top problems may involve complete resurfacing or the repair of spot leaks, flashings or gutters—in any case you will get better results at less cost with Glasfab . . . it's "tops for topside protection".

here's the *GLASFAB* method for resurfacing roofs...

Glasfab method is simple and fool-proof. Glasfab is rolled out and all coating applied over it. Open weave assures penetration of coating.

Coating is smoothed out to produce a long-wearing surface firmly bonded to old roof. Coating is strongly reinforced, stays water-tight.

THE MODERN FIBER GLASS ROOFING MEMBRANE

GLASFAB

Tops for Topside Protection

mail this coupon today

TWINSBURG-MILLER CORPORATION
Twinsburg, Ohio

☐ Please send sample of Glasfab.

☐ Please send folder showing where Glasfab cuts costs.

Name:_____ Title:_____

Company:_____

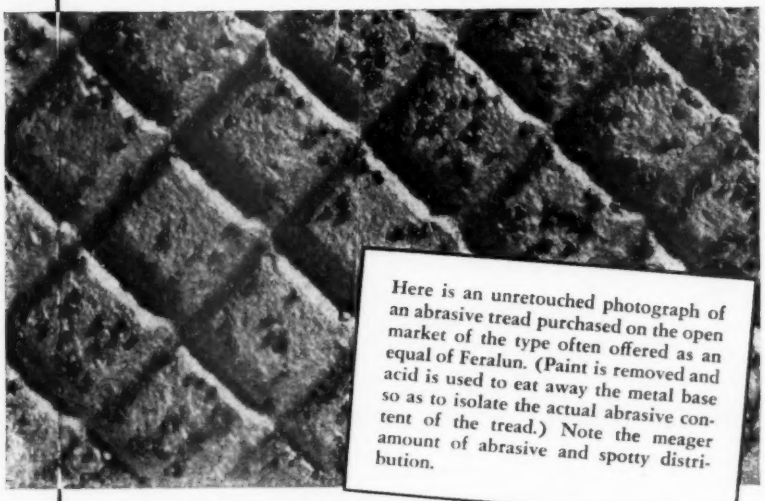
Address:_____

City:_____ State:_____

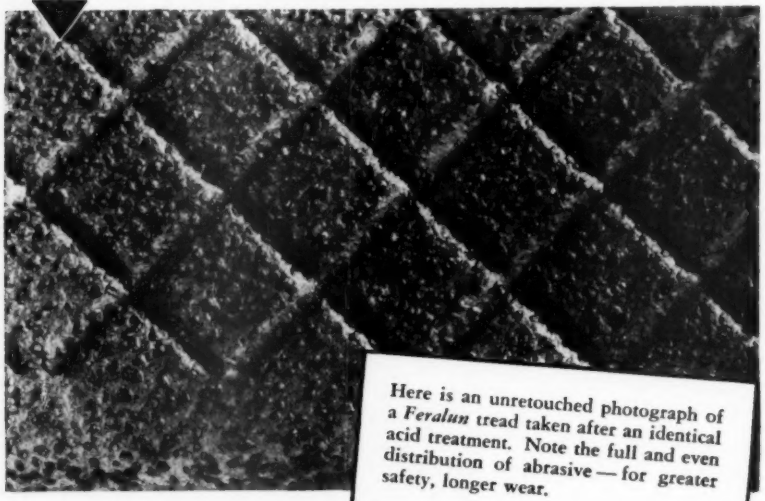
You Judge the Superiority of

FERALUN®

ABRASIVE TREADS



Here is an unretouched photograph of an abrasive tread purchased on the open market of the type often offered as an equal of Feralun. (Paint is removed and acid is used to eat away the metal base so as to isolate the actual abrasive content of the tread.) Note the meager amount of abrasive and spotty distribution.



Here is an unretouched photograph of a *Feralun* tread taken after an identical acid treatment. Note the full and even distribution of abrasive — for greater safety, longer wear.

The life and non-slip effectiveness of any abrasive tread is approximately proportional to the amount of abrasive embedded in the surface. Note that the abrasive of the Feralun tread also extends over the nosing where the danger of slipping is greatest. Feralun has provided lasting safety—free from maintenance—for the past 35 years.

Feralun is available as treads, thresholds, floor plates and elevator sills. Also in Bronzalun, Alumalun and Nicalun. See *Sweet's Catalog 1954 —12b/Am.*

AB117

AMERICAN ABRASIVE METALS CO., IRVINGTON 11, N. J.

NEW FREE CATALOGS

Begins on page B-28

60 · Protective Coatings. Three sheets describe three different protective coating products — a water repellent for masonry, a brush-on, thermal-type insulation for roofs, a paint primer for metals. *Everseal Mfg. Co.*

61 · Building Panels. The spotlight is on steel and aluminum panels in this 44-page catalog. Useful diagrams showing how panels are installed. Tables and specs. *Detroit Steel Products Co.*

62 · Glass Fiber Panels. A 4-page folder (No. 952R) and a detail sheet (DI-1-52) deal with shatterproof, translucent panels. Diagrams show installation methods. *Alsynite Co. of America.*

63 · Building Materials. This 8-page catalog gives features, specs and advantages of maker's wall and ceiling, panels, planks, and blocks. Information on available colors, installation data. Form No 15531. *Marsh Wall Products, Inc*

64 · Metal Lath. You get a run-down on metal lath products and other fireproof building materials in Catalog No. 253. Pictures, engineering data, diagrams. 16 pages *Inland Steel Products Co.*

65 · Lumber. This 24-pager covers lumber that's pressure-treated against termites and decay. Gives six advantages of using maker's product, shows where and how to install it. *American Lumber & Treating Co.*

66 · Engineering Services. Summed up in this 32-page booklet are varied services offered by this design and construction engineering company. Sections on different company functions are included. *Ebasco Services, Inc.*

Turn the page

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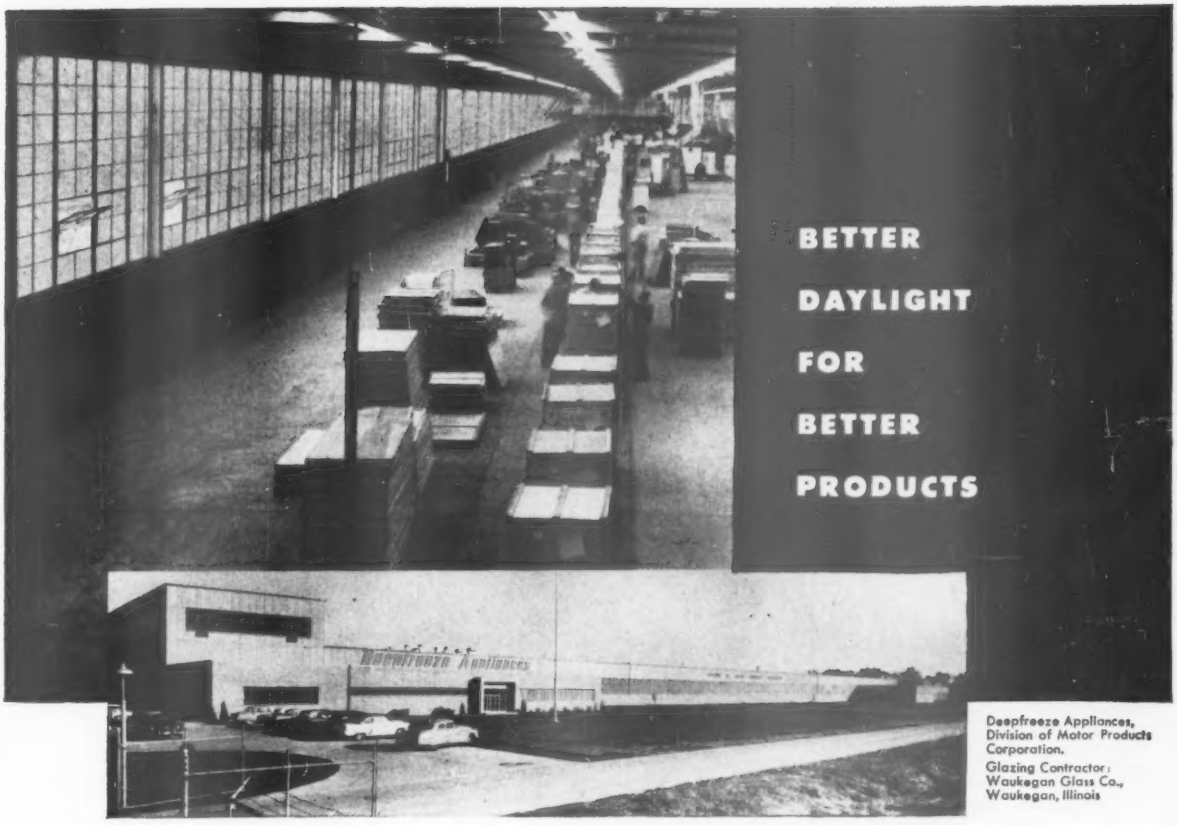

Deepfreeze Appliances, Division of Motor Products Corporation.
Glazing Contractor: Waukegan Glass Co., Waukegan, Illinois

New Deepfreeze Plant Installs Coolite Glass To Eliminate Harmful Effects of "Raw Sunlight"

Deepfreeze, famous manufacturer of modern appliances for modern living, recognizes the importance of proper factory lighting to boost efficiency and employe morale. "Raw Sunlight" contains many factors that adversely affect your workers and their output. Excess solar heat makes interiors uncomfortable . . . and blinding glare makes seeing tasks difficult and tiring. This new Deepfreeze plant is glazed with 8000 square feet of Mississippi Coolite, Heat Absorbing, Glare Reducing Glass, which effectively controls the quality of light flooding work areas . . . banishes objectionable glare . . . cuts costly eye fatigue that results in seeing errors.

The Coolite in this modern plant is glare reduced on both sides, affording a maximum diffusion of light with a minimum of glare. Workers see better . . . feel better . . . work better in better light by Coolite.

If you are planning new construction or modernization, investigate Coolite. See how it can give you increased economy and efficiency. Call your nearby Mississippi Glass distributor today.

Send for free catalog, "Coolite Heat Absorbing and Glare Reducing Glass." Samples on request.

MISSISSIPPI *Glass* COMPANY

88 ANGELICA ST. SAINT LOUIS 7, MO.

NEW YORK • CHICAGO • FULLERTON, CALIF.

see our catalog in ARCHITECTURAL FILE or write for copy

WORLD'S LARGEST MANUFACTURER OF ROLLED, FIGURED AND WIRED GLASS

Get Smooth Long-Life Floors with STELCON

Both rubber and steel wheels work well on STELCON Plates.

Floors subject to heavy factory service can be fully protected with Armco STELCON Anchor Plates—and at low cost.

STELCON Anchor Plates are made of heavy 11-gage steel for strength and durability. Each plate is one-foot square and has 53 projections to make permanent anchorage in concrete floors. They may be laid in new monolithic floors or used in a topping layer over old floors. No special skill is required for installation, and the job goes fast.

There is no troublesome grease or oil absorption, and the plates provide good traction. Write for details. Armco Drainage & Metal Products, Inc., 3894 Curtis Street, Middletown, Ohio. Subsidiary of Armco Steel Corporation. In Canada: write Guelph, Ontario.

STELCON
Anchor Plates

ARMCO

CONTINENTAL fence

brings you **KONIK** *for*

Greater Resistance to Rust

CONTINENTAL
STEEL CORPORATION • KOKOMO, INDIANA

Only Continental Chain Link Fence is made of Konik steel containing copper, nickel and chromium for greater strength and rust resistance. Heavy galvanizing after weaving adds still more protection. Write Today for Lasting Security

PRODUCERS OF Manufacturer's Wire in many sizes, shapes tempers and finishes, including Galvanized, KOKOTE, Flame-Sealed, Coppered, Tinned, Annealed, Liquor Finished, Bright, Lead Coated, and special wire. ALSO, Coated and Uncoated Steel Sheets, Nails, Continental Chain Link Fence, and other products.

CONTINENTAL STEEL

Continental Steel Corp.
Kokomo, Indiana

Please send FREE copy of "Planned Protection"—complete manual on property protection

Name _____

Address _____

City _____ State _____

NEW FREE CATALOGS

Begins on page B-28

67 · Glass Mat. Illustrated folder describes glass mat, used primarily as concrete curing paper. Gives complete information on features and advantages, specs and applications for the material. Tells how to use, too. *Angier Sales Corp.*

68 · Fence. You learn how to select the proper security fence for the job in maker's 48-page catalog No. F-901. Features and specs for the entire line, photographs of each. *Colorado Fuel & Iron Corp.*

69 · Fence. You'll read about wire security fences in two 8-page catalogs, A-50 and E-50. Diagrams show construction details. Photos show typical installations. Also specifications, features, and advantage. *Atlas Fence Co.*

70 · Railroad Crossing. This 6-page catalog outlines advantages of railroad crossing made of depth-hardened, manganese steel. Photos and diagrams show top and cross sections of the product. *U. S. Steel Corp.*

71 · Bolting. An 8-page pamplet about high-tensile bolting. Summarizes advantages of this method of fastening structural steel. Includes specification tables. Tells when to use. *The Cleveland Cap Screw Co.*

72 · Wire Rope. Uses for wire rope are recommended in a 56-page catalog that also describes maker's products. Fully indexed for easy reference. Construction data tables are included. *John A. Roebling's Sons Corp.*

73 · Anchoring, Drilling Devices. Pocket-size, 34-page catalog (No. 68) and companion literature on anchoring and drilling

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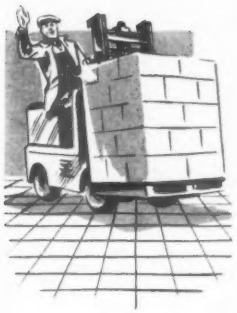
For storage space use the flooring ace



TUFF-TEX GREASEPROOF INDUSTRIAL TILE

Where trucks dish it out . . . and floors must take it . . . that's where you'll really appreciate a tile like Tuff-Tex*!

For the constant moving of stock can put weak-sister floors out of business . . . making working conditions rough and operating costs high.

But don't get the idea that a Tuff-Tex floor is drab-looking just because it's a truly heavy-duty material that takes traffic and grease.

Tuff-Tex comes in a variety of stimulating colors that helps workers' morale. And the colors aren't just on the *surface*. They go all the way through . . . won't wear off.

As for *cleaning* Tuff-Tex . . . it's really a cinch. Just daily sweeping to remove loose dirt and periodic washing do the trick. Grease wipes off easily.

*REG. U. S. PAT. OFF.

Tile-at-a-time installation and the wide range of colors and tile sizes enable you to design floors for decorative or functional purposes . . . to outline shipping areas, traffic aisles, material bays, etc.

Ask your Tile-Tex* Contractor about Tuff-Tex. He is listed in the classified pages of your telephone directory. You'll find his counsel invaluable . . . not only about the proper flooring material for your problem . . . but also for his knowledge of floor design and layout.

Get in touch with him today. Or write us.

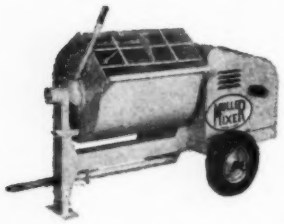
THE TILE-TEX DIVISION, The Flintkote Company, 1234 McKinley Street, Chicago Heights, Illinois

Tile-Tex—Pioneer Division, The Flintkote Company, P. O. Box 2218, Terminal Annex, Los Angeles 54, California

The Flintkote Company of Canada, Ltd., 30th Street, Long Branch, Toronto, Canada

TUFF-TEX GREASEPROOF INDUSTRIAL TILE

Better cores make Better Castings



You can save time and money and make better cores with the Muller new 3½ Cubic Foot Core Sand Mixer. It mixes 250-300 pounds per batch. Better cores mean better castings. This new, labor-saving Core Sand Mixer will "buy itself" out of savings in a short time.

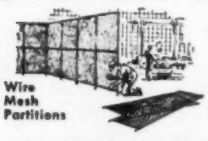
PRICE: $356.00 complete with 1½ H.P. Electric Motor ready to plug in, F.O.B. Metuchen, New Jersey.

This Mixer is also available in 6, 6 to 8, and 9 Cubic Foot sizes.

MULLER MACHINERY COMPANY, Inc.

Dept. FM, Metuchen, N. J. Cable MULMIX

For complete protection surround your property with a Stewart Chain Link Wire Fence—cover windows and skylights with wire guards—place steel folding gates at doors—protect tools, materials, etc., with wire mesh partitions. Stewart literature tells the whole story. Write for it today. Please mention products in which you are interested.


Wire Mesh Partitions

THE STEWART IRON WORKS CO., INC.
2156 Stewart Block, Cincinnati 1, Ohio
Experts in Metal Fabrications since 1886

Stewart IRON and WIRE FENCES

NEW FREE CATALOGS
Begins on page B-28

devices for making fastenings to masonry are offered. *Arro Expansion Bolt Co.*

74 · Roofing and Siding. Corrugated asbestos cement is described in this 26-page catalog. Diagrams supplement text. Specifications and installations data on maker's products. Notes on handling and stacking. *Asbestone Corp.*

75 · Mixing Machines. Two bulletins—a 2-pager (A5) on concrete mixers, and a 4-pager (A-22) on core sand mixers. Specifications. Prices of core sand mixers. Other useful information is included. *Muller Machinery Co.*

76 · Glass Blocks. How to pick the right glass block for your building is a feature of this 24-page catalog. Data on light transmission and insulation values. Installation drawings and specifications are given. *Pittsburgh Corning Corp.*

77 · Glass. A 16-page catalog (No. 54) shows you uses of five types of glass—translucent, figured, corrugated, wire, and Coolite. Photos illustrate light distribution properties. Engineering data tables give helpful information. *Mississippi Glass Co.*

78 · Glass Products. A complete line of products is reviewed in this 12-page catalog. Includes many kinds of windows, doors, mirrors, glass blocks. Charts, tables, photos. Suggests possible uses. *Pittsburgh Plate Glass Co.*

79 · Asphalt Products. A collection of bulletins and spec. sheets on one company's line. Includes floor patching material, mastic flooring, and several protective coatings. Tells how to use each. *Bitucote Products Co.*

➧ To get these catalogs, circle item numbers on the Reader Service card next to back cover.

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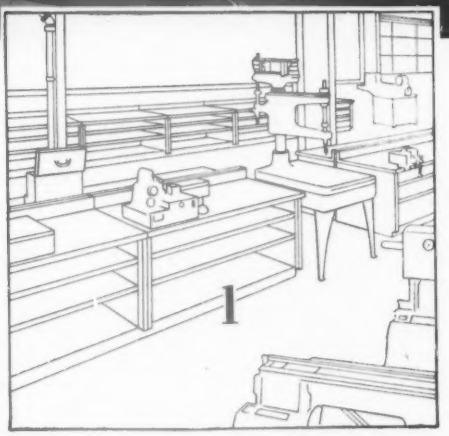

1. Cabinet Benches

HALLOWELL® SHOP EQUIPMENT DIVISION SPS JENKINTOWN PENNSYLVANIA

Warehouse, National Bellas Hess, Inc., North Kansas City, Mo.
Architects, Kivett and Myers. Angus McCallum, Associate.

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BEECH AND BIRCH

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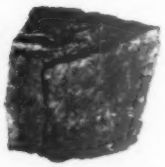

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Process NATURAL EMERY

crush it into PROPER SHAPES
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the shapes and sizes into a *100 pound unit*

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which provides a flexible covering of stone

Because they are made of the mineral, asbestos, the felts of a Johns-Manville Flexstone Built-Up Roof assure lasting service and protection. They will not support combustion. They effectively resist the drying-out action of the sun . . . won't rot, are weatherproof and need no periodic coating.

Flexstone Built-Up Roofs are smooth-surfaced . . . permit thorough drainage . . . make damage easy to locate and repair. These superior advantages are also provided by the J-M Flexstone Special Built-Up Roof . . . developed especially for dead-level decks.

For complete information about Flexstone Roofs and J-M Asbestile* Flashing System that provides thorough water tightness and effective treatment for critical roof areas, see your Approved Johns-Manville Contractor. He's listed in the Classified Section of the telephone directory. Or send for folder BU-51A. Write Johns-Manville, Box 158, New York 16, N. Y. In Canada, write 199 Bay St., Toronto 1, Ont.

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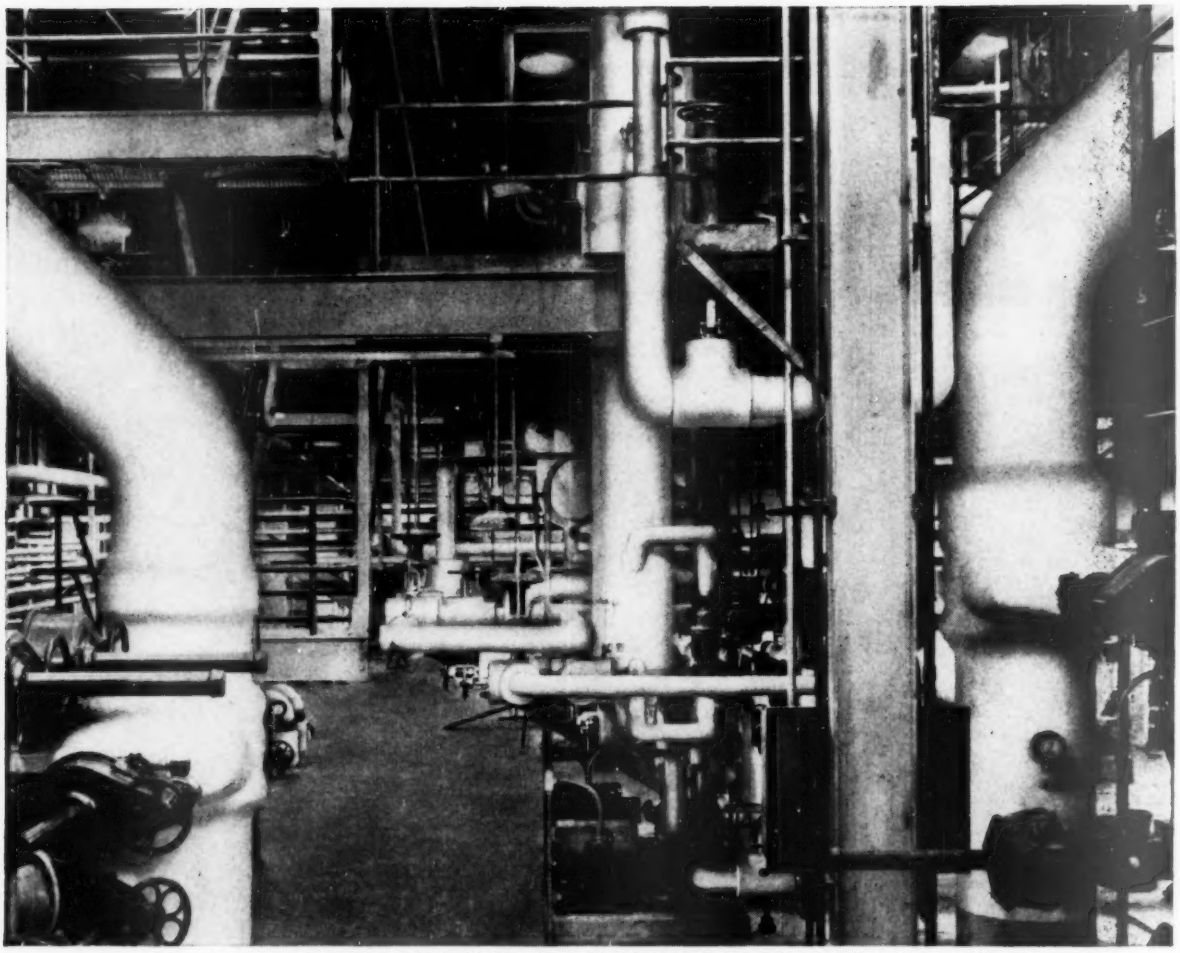

Extraction unit and piping insulated with "Featherweight" 85% Magnesia. Sabrooke Plant, Rockford, Ill., of the Central Illinois Electric and Gas Co. Insulating Contractor: Standard Asbestos Manufacturing Co., Chicago

BEFORE YOU INSULATE, INVESTIGATE

"Featherweight"® 85% MAGNESIA

The Sabrooke Plant of the Central Illinois Electric and Gas Co. (illustrated) is typical of the thousands of installations where "Featherweight" 85% Magnesia efficiently conserves heat.

"Featherweight" 85% Magnesia has for years—more than 60—effectively fulfilled the needs of schools, hospitals, hotels, apartment and office buildings, power plants, factories—wherever efficient conservation of heat is of importance.

"Featherweight" 85% Magnesia is more than efficient. It cannot burn and will not corrode because it is inorganic. It is light in weight and structurally stable. It is made in simplified thicknesses for pipe installations, so that each size and thickness will fit over or into another size and thickness. This is important where two layer thicknesses are desired and for reducing inventories.

If your company has an insulating problem, the chances are that "Featherweight" 85% Magnesia can help you save heat, save money! Your K&M distributor is an experienced applicator who will gladly give you more information, or write directly to us.

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K&M best in asbestos®

Are your floors the *Weak Link* in production?

Production should keep on the move

. . . but it can't move smoothly and economically over cracked and broken floors.

That's why, today, more and more plant managers and engineers insist on Flintkote *Cold-Laid Asphalt Mastic* wearing surfaces for industrial floors.

Asphalt Mastic—made with cement, aggregates and time-tested Flintkote Flooring Emulsions—goes down fast, cures quickly, and may be opened to traffic early. Laid in thin or thick section over new or old floor bases, it withstands the heaviest trucking you want to impose.

Flintkote Cold-Laid Asphalt Mastic is resilient, shock absorbing, quiet, comfortable under foot and easy to maintain.

Keep production rolling over floors that can take it! Let us send you suggested specifications for installation by contractor or your own forces, resurfacing and patching old floors. Write today.

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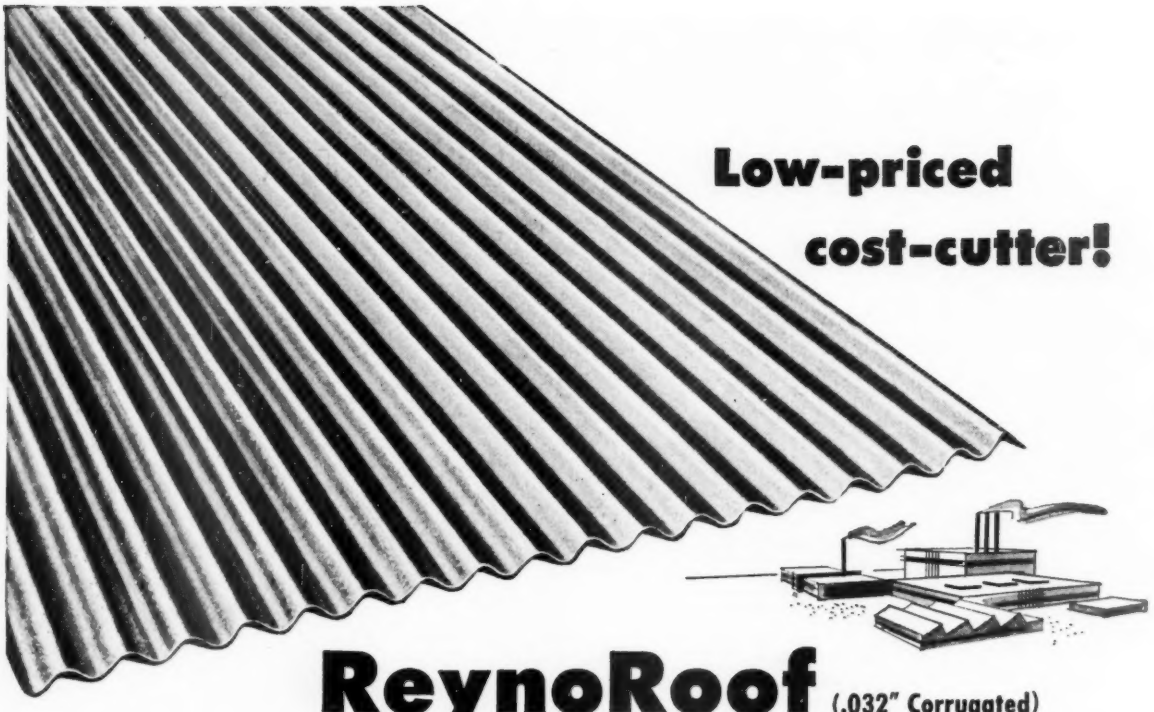
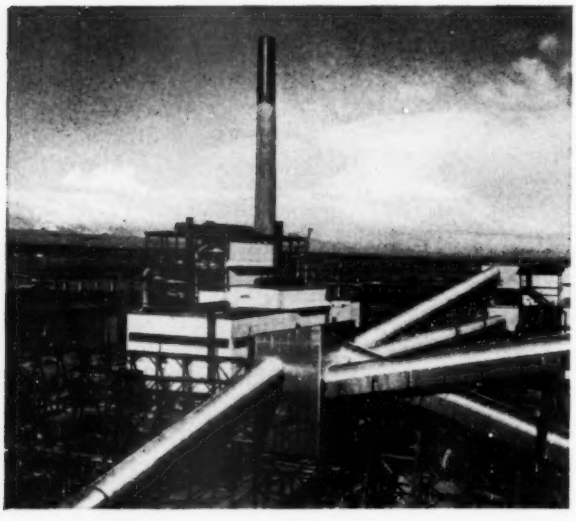


Low-priced cost-cutter!

ReynoRoof (.032" Corrugated)



A complete installation service is available. For name of nearest jobber-erector, call the Reynolds office listed under "Building Materials" in classified phone books of principal cities. Or write to Reynolds Metals Company, Building Products Division, 2007 South Ninth Street, Louisville 1, Kentucky.

low price PLUS lowest maintenance

No other material has so many advantages, adding up to greatest economy! Aluminum costs less to apply. Rust-proof and corrosion-resistant, it costs practically nothing to maintain. High radiant heat reflection (up to 95%) cuts the cost of year-round temperature control. In ReynoRoof, you get all these advantages at lowest initial price. ReynoRoof is excellent for siding, too. Write for literature.

DESCRIPTION:

Industrial Corrugated, 48" width, embossed finish.
Industrial Corrugated, 35" width, mill finish.
.032" thickness (22 U.S. Std. Ga.).
Lengths 5' to 12' in 6" increments.
Weight approx. 56 lbs. per 100 sq. ft.

Also ReynoSide, ribbed embossed siding, ribs 4" or 8" o.c., 1" deep. Lengths up to 14' 5½".

SEE "MISTER PEEPERS," starring Wally Cox, Sundays, NBC-TV Network.

REYNOLDS ALUMINUM
BUILDING PRODUCTS

"We saved the cost of a new heating plant with PC Glass Blocks,"

says **E. W. Meyers, Jr.,** *President, Trion, Inc., Pittsburgh, Pa.*

Trion, Inc. is a world-famous manufacturer of electronic air cleaning equipment, so naturally they didn't want dirt seeping into their plant.

The old steel sash let in dirt. And, it leaked so much air that the heating plant was inadequate. Trion licked both of these problems and got a better looking building to boot when they eliminated the steel sash and installed PC Glass Blocks.

Mr. Meyers says, "We not only saved the cost of a new heating plant, but we *reduced our heating bill* as well. The PC Glass Blocks have eliminated dirt infiltration, and our building looks better than ever before."

In summary: PC Glass Blocks will improve the appearance of your building, give much better daylighting, and reduce dirt. They also cut heating and cooling bills because a PC Glass Block panel has the insulating efficiency of an 8-inch masonry wall.

For the full story, write Pittsburgh Corning Corporation, Dept. N-64, One Gateway Center, Pittsburgh 22, Pa.

Pittsburgh Corning Corporation

PITTSBURGH, PENNSYLVANIA

BEFORE AND AFTER—

A PC Glass Block face lifting will improve the appearance of most any building . . . and will increase its value.

Here's what you get with PC Glass Blocks

BETTER DAYLIGHTING—Functional patterns direct daylight to reflective ceiling, or distribute it uniformly throughout the room. More light, less glare.

REDUCED HEATING & COOLING COSTS—Glass block panels have insulating efficiency of an 8-inch masonry wall.

LOWER WINDOW MAINTENANCE COSTS—Glass block panels seldom have to be washed. Breakage is rare, and there is nothing to paint.

NO "EXTRA" EXPENSE—Unlike conventional windows, panels of PC Functional Glass Blocks seldom if ever need expensive shades, blinds or louvres.

NO DIRT INFILTRATION—A glass block panel is an integral part of your building wall. Tight mortar joints seal out moisture, dirt.

LESS OUTSIDE NOISE—PC Glass Blocks are hollow. The internal dead air spaces reduce sound transmission.

A stopwatch and a broom can teach plant managers this money-saving lesson

New KENFLEX floors really cut maintenance costs

Why not try it yourself and see how long it takes to *really* clean your present floors! Then, remember that labor time costs money and you'll see why the economical solution to upkeep problems is new KenFlex Vinyl Tile...*a truly greaseproof flooring,* specially created to clean easier, faster, thoroughly...for far less cost.

Smooth, colorful KenFlex never needs waxing except for *extra* gloss...is unaffected by alkalis, alcohols and acids. KenFlex is the one modern floor designed for longer wear wherever spilled greases and oils present a costly maintenance problem. Yet, KenFlex costs less than many floors that offer just a few of its quality features.

Get full details on KenFlex Vinyl Tile—and other Kentile, Inc. resilient tile floors—from the Kentile Flooring Contractor. He's listed under FLOORS in the Classified Phone Directory.

KENFLEX
VINYL TILE ®

KENTILE • KENCORK • KENRUBBER • KENFLEX • KENFLOR
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Kentile, Inc., 58 Second Avenue, Brooklyn 15, N. Y.

No costly maintenance problem here

Corrugated Transite has been featured in this contemporary plant design. The shadow lines of the corrugations provides decorative interest for the large wall areas.

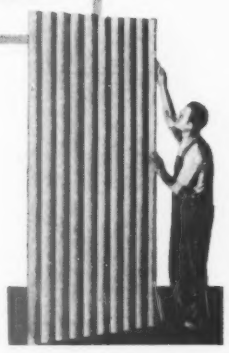
build with Transite Corrugated Asbestos Sheets

For maintenance-free exterior walls and roofs, plus protection from fire, rot and weather

YOU SAVE MONEY on construction and maintenance when you build with Johns-Manville Corrugated Transite®. Corrugated Transite comes in large sheets that require a minimum of framing . . . permits fast economical construction of maintenance-free industrial, commercial, institutional and agricultural buildings.

Made of asbestos and cement, Corrugated Transite is practically indestructible. It never needs paint or special treatment to preserve it . . . it's fireproof, rotproof and weatherproof. Corrugated Transite is also used increasingly for smart interiors . . . the streamlined corrugations and attractive shadow lines that give it such unusual architectural appeal for exteriors offer unlimited interior design possibilities.

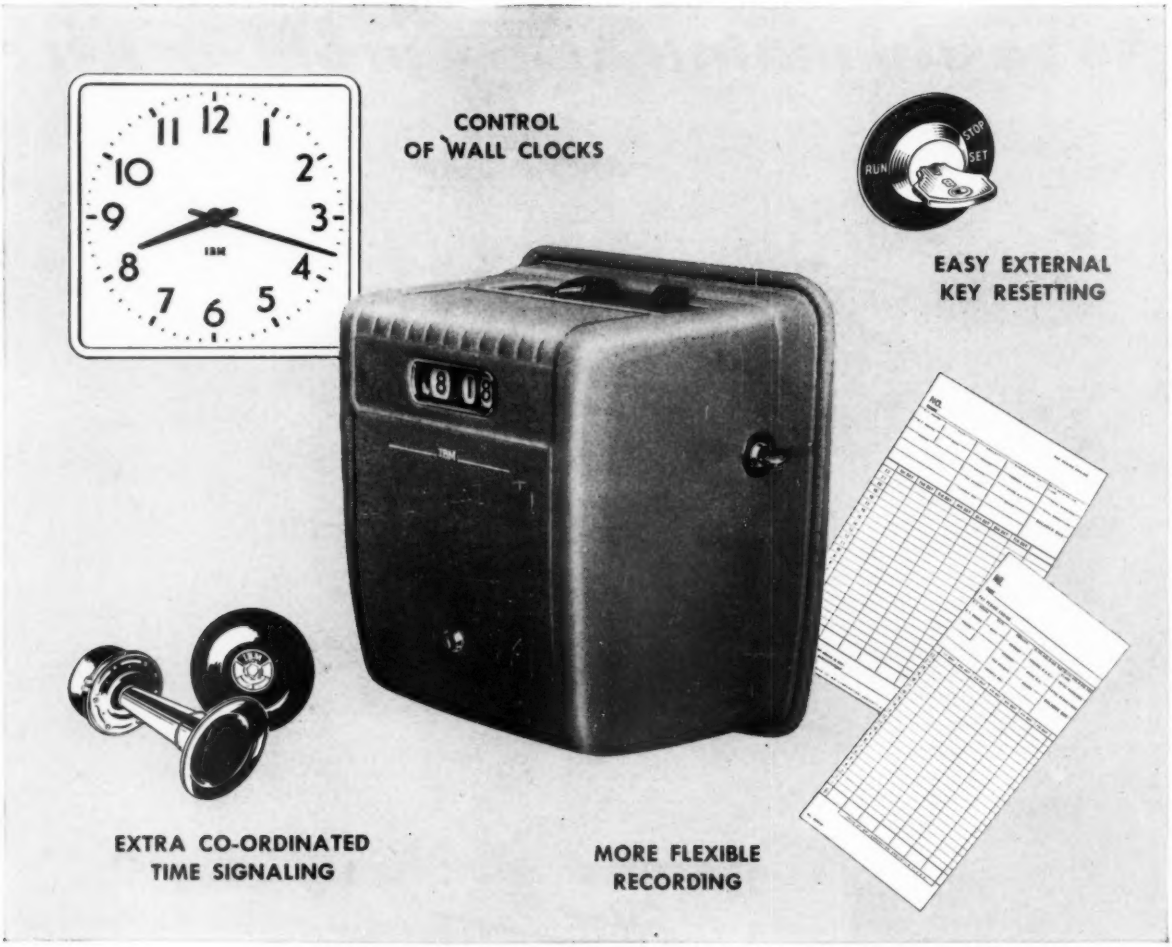
Investigate Johns-Manville Corrugated Asbestos Transite and learn how you can build quickly and easily . . . have an attractive, long-lasting, trouble-free structure regardless of size or purpose. For complete details write Johns-Manville, Box 158, Dept. FM, New York 16, New York. In Canada write 199 Bay St., Toronto, Ontario.



- Large sheets go up quickly
- Easy to fasten to steel
- Easy to nail to wood
- Easy to saw
- Easy to drill

JOHNS-MANVILLE PRODUCTS

Johns-Manville



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Feature around-the-clock self-regulation . . . as much as 12 hours when required. Need no special clock and signal wiring. Easy, economical to install, alter, expand.

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You're RIGHT on TIME with IBM Time Equipment

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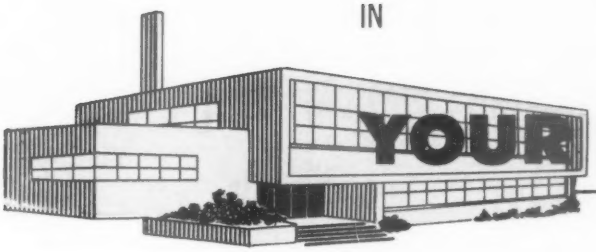
ELECTRICAL SERVICES

IN



YOUR 195X PLANT

SECTION C—INDEX

Two basic tools for 195X planning ...

A-B-C Rating Chart for Electrical Services C-2

How to Get Your Electrical System Ready for 195X C-4

... plus one case in modernization for 195X

From Radial to Network Distribution C-10
International Harvester Company

... and two significant new plants for 195X

An Electrical System That's Ready for Anything C-14
Westinghouse Electric Corporation

How a Small Power User Plans for 195X C-20
Chicago Pneumatic Tool Company

New Free Catalogs C-36

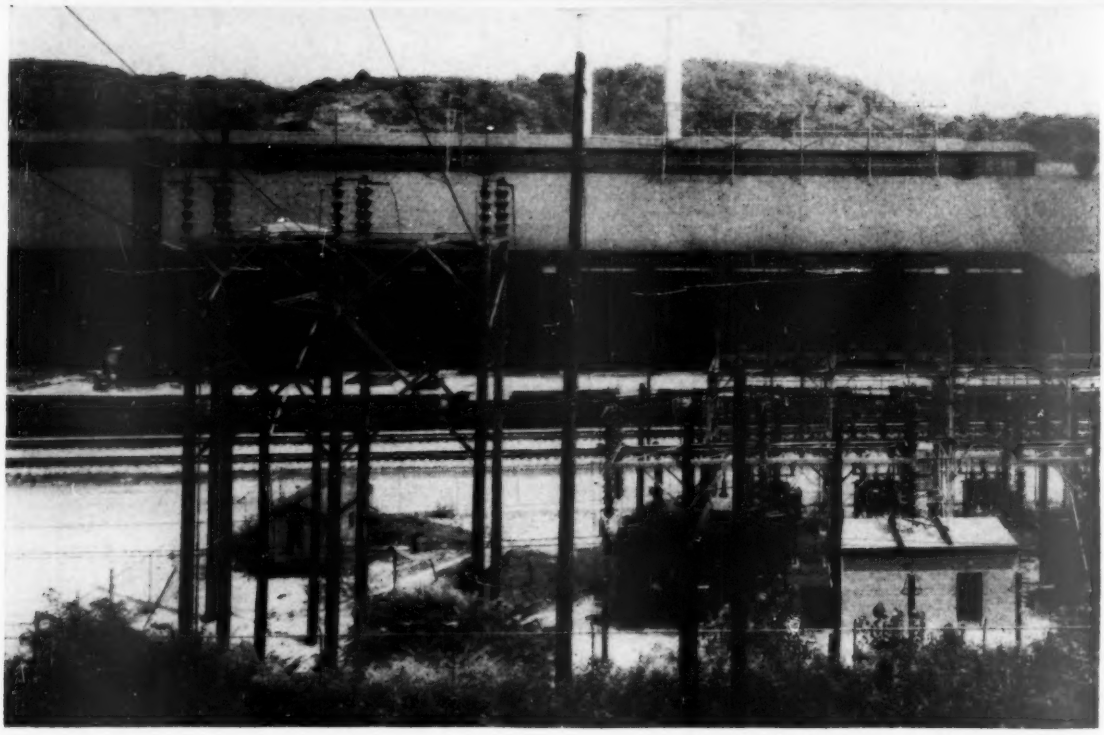
FACTORY's A·B·C RATING CHART FOR ELECTRICAL

INSTRUCTIONS. Rate A for excellent, B for fair, C for poor. Skip squares if items or headings are not applicable. A row of A's means you're in good shape. A row of B's and C's points to the need for action.

	DO YOUR RATING IN THESE COLUMNS . . .								CHECK ACTION HERE . . .				
									WHAT			WHEN	
	PHYSICAL CONDITION	CAPACITY FOR PRESENT NEEDS	CAPACITY FOR NEXT YEAR	CAPACITY FOR 195X	OPERATING COSTS	MAINTENANCE COSTS	OUTLOOK FOR LONG SERVICE	DEPENDABILITY FOR MINIMUM DOWNTIME	REPAIR	REPLACE	ADD NEW	NOW	LATER
INCOMING SUPPLY													
1 • Voltage													
2 • Dual power													
3 • Power company reliability													
4 • Power company capacity													
POWER GENERATION													
1 • Steam generators													
2 • Turbo-generators													
3 • Diesel generators													
4 • Main switchgear													
MAIN SUBSTATION													
1 • Location													
2 • Power transformers													
3 • Potential transformers													
4 • Power dispatch board													
5 • Relaying													
6 • Transformer taps													
7 • Switchgear													
8 • Circuit breakers													
9 • Control room													
10 • Metering													
11 • Switch rack													
12 • Grounding system													
13 • Battery rack													
PRIMARY DISTRIBUTION													
1 • Voltage													
2 • Switching facilities													
3 • Underground ducts and manholes													
4 • Underground cables													
5 • Overhead cables													
6 • Length of cable runs													
7 • Location of cable (overhead vs. underground)													
8 • Load center substations													
9 • Location of substations													
10 • Vaults													
11 • Transformers													

SERVICES . . . FOR YOUR 195X PLANNING

	DO YOUR RATING IN THESE COLUMNS . . .								CHECK ACTION HERE . . .				
									WHAT			WHEN	
	PHYSICAL CONDITION	CAPACITY FOR PRESENT NEEDS	CAPACITY FOR NEXT YEAR	CAPACITY FOR 195X	OPERATING COSTS	MAINTENANCE COSTS	OUTLOOK FOR LONG SERVICE	DEPENDABILITY FOR MINIMUM DOWNTIME	REPAIR	REPLACE	ADD NEW	NOW	LATER
12 • Switchgear													
13 • Distribution system (network vs. radial)													
14 • Direct lines to high hp. motors													
15 • Equipment instrumentation													
16 • Distribution metering													
17 • Circuit breakers													
SECONDARY DISTRIBUTION													
1 • Cables													
2 • Bus duct													
3 • Panel boards													
4 • Power and lighting circuits													
5 • Motor control centers													
DC POWER													
1 • Incoming supply (power company)													
2 • Motor generators													
3 • Rectifiers													
4 • Rotary converters													
5 • Adjustable speed units													
6 • Switchgear													
7 • Distribution system													
LIGHTING													
1 • Lighting transformers													
2 • Office areas													
3 • Production areas													
4 • Yards and grounds													
5 • Drafting and engineering													
6 • Special areas													
7 • Emergency lighting													
POWER FACTORY IMPROVEMENT													
1 • Capacitors													
2 • Synchronous motors													



"... and gear to handle 132,000 volts costs plenty."

This 132,000-volt substation is the source of power for the Allenport works of Pittsburgh Steel Company. You can see the utility's high voltage lines coming

How to Get Your Electrical System Ready for 195X

By FRANK W. MICHAL • Electrical Editor, FACTORY

You can get off to a flying start by filling out FACTORY's A-B-C Rating Chart for Electrical Services. You'll find it on the two preceding pages.

The A-B-C Rating Chart Will . . .

. . . help you develop a master plan projected for the next 10 years. Working with the chart, you should lay out an "ideal" power system, of the type and voltages best suited for the plant you'll have then—your 195X plant. Don't worry about what electrical equipment you have now. Plan it as if you were building a whole new plant. On the A-B-C Chart you'll notice a column heading: "Capacity for 195X." That suggests: Make sure your master plan allows for plenty of expansion.

. . . show you how much of the present system fits the master plan. What this involves, of course, is taking a careful inventory of your present system, its condition, and its capacity. If you rate every item according to the instructions on the chart, you'll know exactly where you stand now, where you'll stand next year, and in 195X.

By comparing this inventory with your master or "ideal" system, you'll have a good idea of what action you need to take.

A word of warning: Don't be tempted into revising the master plan to take in some of your existing equipment that is on the doubtful side.

Why this approach? We suggest using the A-B-C Chart for one all-important reason: *It forces you to do a careful planning job.* Unless you back off and take a long look at modern practices in power distribution, you can spend a lot of money and end up with a system that is little, if any, better than what you started with. If you get off to the right start, you can have a greatly improved system that will take care of your electrical needs for a long time, and at a minimum of cost.

Doesn't apply to you? We bet it does. Unless you're planning, at least in a general way, for your power demand to double in the next 10 years—you're asking for trouble. That's been the rate of

in at the left. The 25,000-volt lines serving the mill distribution centers can be seen leading to the structure on top of the hot mill building in the background.

increase in recent years. There's no reason to expect it to taper off. Even if you do not build a single new building in the next 10 years, the use of electrical power per unit of product will be going up. Your industrial engineers will pack more equipment into present production layouts. This means more power. And you've got to be ready to handle it.

Watch for these storm warnings • Most plants built before and during the last war, and a fair share of those built since, will have at least some of these storm warnings flying. Read on and check them out: See if they're not up in your plant.

1) Main substation overloaded • You may not be able to get an additional block of power in a hurry. Your power company may agree to supply the power, but you may have to improve or add to your main substation. Or your circuit breakers may not have enough interrupting capacity for the new load. Transformers may have to be taken down from poles and put on concrete mats. The symptom is . . .

2) Power shortages • How many times have you had to pass up a production improvement because the cost of supplying the necessary power would offset much, or all, of the savings of the new method (for example, a new welder that would require a new substation at twice the cost of the welder)? Or do you have any big motors in the shop that you can't start without shutting down other equipment on the same feeder? You'll hear about power shortages from the production departments. Here's where you're sorry about not providing capacity for expansion.

3) New plants on feeder serving your plant • A heavy new load on your feeder may involve beefing up your circuit breakers and other protective equipment, to protect not only yourself but also others on the line. The power company can require you to take the necessary steps.

4) Frequent power outages • This kind of trouble hurts you in your pocketbook. Loss of power means loss of production. It can also cause damage to equipment and material in process.

5) Low voltage • The symptoms are obvious. You'll get complaints for more light from the shop. Fluorescent lights will flicker. Furnaces and heaters will not come up to heat. Motor rewind bills will go up as motors heat up and burn out. Electronic controls and welding equipment will become erratic. Motors starting heavy loads will not come up to speed, will be tripped off the line by their overload relays.

6) "Elderly" and open switchgear • There are no symptoms to warn you of this danger. The first sign that a circuit breaker is inadequate is usually the last. Wham! And what's left of it is out in the parking lot. Breakers over 15 years old, and the smaller type of breaker, should be looked on with suspicion, especially if changes or additions have been made to your power distribution system. And trouble on any part of open switchgear usually results in total destruction of the whole unit.

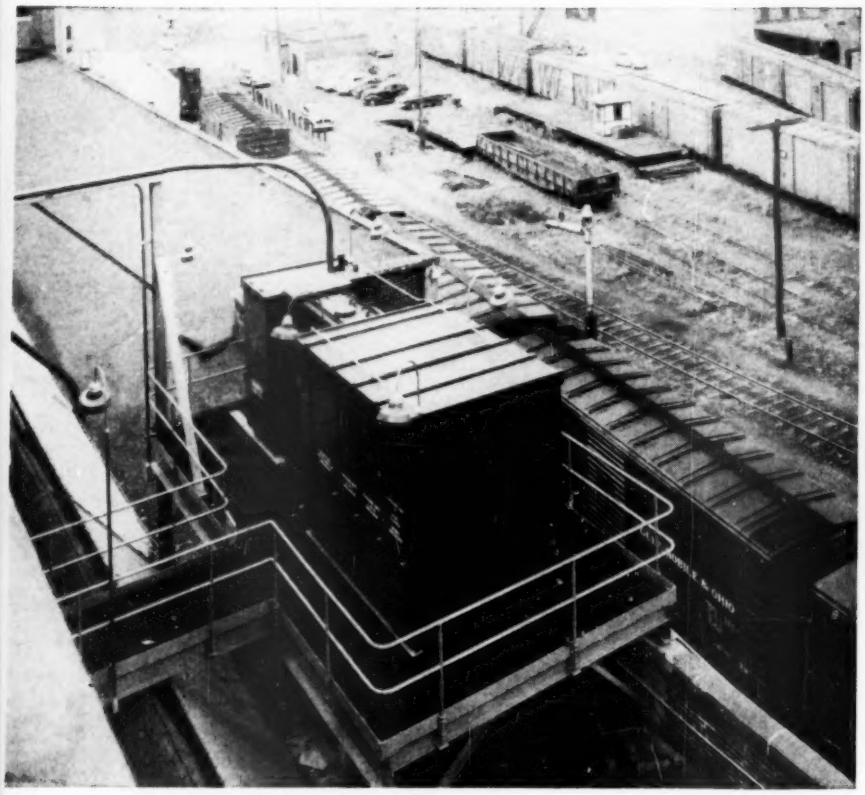
7) Frequent shutdowns for maintenance or cutting in of new equipment are a sure sign of the need for modernization. And when an order for spare parts comes back from the manufacturer marked "No Longer In Stock," and the maintenance department starts making parts, you can be sure the time for modernization has come.

8) Low lighting levels • When you make an addition to the plant, you put in the latest in lighting. If the new lighting causes workers to comment about the contrast with the dismally lighted areas where they work, the time has probably come.

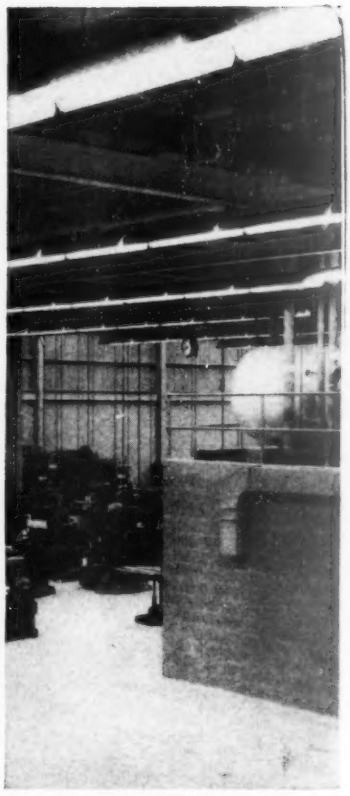
9) A notice from your insurance carrier is a good storm warning. It is very conscious of anything that might touch off a fire or explosion, or cause injury to your workers.

10) Power bills too high • The cost of power is becoming a large item on most operating budgets. Unless your distribution is modern enough to take advantage of control of demand and power factor, two of the major items on your bill, you probably need modernization. Sometimes the cost, or a major part of the cost, of a modernization can be returned to you by a reduction in your power bill. You can have your cake and get paid for eating it.

For ways to improve your electrical system, turn the page



"PUT YOUR SUBSTATION ON THE ROOF . . .



. . . OR ON A MEZZANINE—TO

When you plan your electrical system for 195X, ask yourself these questions...

. . . ABOUT YOUR INCOMING POWER

Will the additional power I'll need be available; and if not, when will it be?

The power company needs your expansion plans in order to plan their system. If you need a lot of power fast, you may have to pay part of their cost to give it to you. You can avoid this cost if you can wait until the utility can take you on easily.

Will it mean a change in incoming voltage?

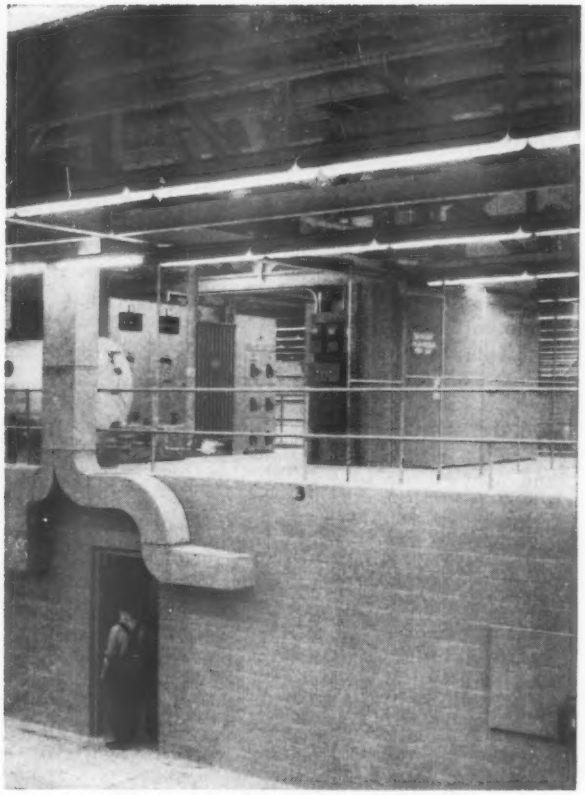
Unless you are already getting power at 33,000 volts or higher, requests for more power may mean shifting to these higher voltages. And this will call for a new main substation, which will put a big dent in your appropriations.

Will I need new switchgear?

Don't feel secure if you are now getting high voltage power. Your switchgear may be inadequate to handle the increased short-circuit currents that your 195X demand will introduce. And the power company can make your switchgear inadequate overnight by expanding its system in excess of the short-circuit rating of your equipment.

Should I get dual power feeds?

The reliability these feeds offer, will probably pay off. More and more modern plants are installing extra feeders, as a guarantee against loss of production should the normally used feeder fail. Automatic switching can cut downtime. It will be well worth while to consider this.



SAVE HIGH-PRICED MANUFACTURING SPACE."

... ABOUT THE MAIN SUBSTATION

Will the power company supply the main substation? Or do I have to?

In most parts of the country, you will be expected to supply the main sub, particularly if the incoming supply is over 4160 volts. In many suburban areas power can be supplied only at very high voltages—up to 133,000 volts. Gear to handle that kind of power costs plenty.

Do I have plenty of transformer capacity for future needs?

Don't depend on fans to carry the overload. Fans should be standby, for emergencies where one transformer has to take on extra load.

Have I switching facilities so that maintenance in the main substation does not require shutdown?

One plant we know had dual transformers, dual main circuit breakers; in short, a modern substation. But it did not provide the necessary disconnects on the incoming feeders so that the switches on the plant side of the line could be lubricated. Failure to provide this $800 worth of switches necessitated complete plant shutdown twice yearly.

Should I provide room for another transformer when I put up the rack?

It won't cost one-tenth as much to provide the space when the original installation is made as it will to add on later.

Do my transformers have taps on the windings to correct for high or low voltage?

The power company may scoff at the idea, since its voltages may be well regulated at the time the station goes in. But they may not be well regulated in 195X.

Is the main switchgear alongside the transformers?

This saves long bus runs to the switchgear, keeps switchgear out of the plant—saving floor space. Weatherproof switchgear costs a little more than indoor gear, but this added cost may be offset by the cost of providing space in the manufacturing area, and extra bus duct.

Should I provide a modern control room?

Yes, if your system is fairly large or complex. This room will include all of the power company's and your own meters, control for switchgear and circuit breakers, and the batteries for operating the circuit breakers. Also worth while: a power dispatch board where the whole distribution system is shown, with every switch and circuit breaker indicated as open or closed. With such a board, when emergencies arise, the necessary switching can be done in a minimum of time.

Do I have enough metering facilities?

It's a good idea to duplicate the power company's meters. The records they provide will help you watch the use of power throughout the plant, help you find ways to cut costs.

Is the switchboard well lighted?

Somehow a lot of switching has to be done at night. It's hard to open and close switches with one hand while holding a flashlight in the other.

Should I provide relaying on dual feeders?

It's foolish to spend the money to provide a dual feed, and then not get the benefits of automatic control in case of trouble. Manual switching takes time.

More helpful suggestions on the following pages

When you plan your electrical system for 195X, ask these questions, too . . .

. . . ABOUT YOUR PRIMARY DISTRIBUTION

Should I plan on higher distribution voltages and unit load centers?

This means distribution at, say, 4160 volts from the main substation to unit substations near the load, transforming it there to 480 volts. Main advantages: big reduction in heavy, costly, loss-producing 480-volt cable, much less voltage drop, greater ease of expansion (just run out more small cable, add another unit substation). Short circuits will be less of a headache—modern circuit breakers can take anything your power system can dish out. And the breakers can be taken out of service for maintenance work without any disturbance to the rest of the circuits.

Are there good switching facilities?

If equipment has to be taken out of service for repairs or maintenance, or if new equipment has to be connected into the power system, you'll be faced with a plant shutdown unless you've provided switching facilities to cut out the area to be worked on. One shutdown will often cost more than these facilities would.

Do I have modern transformers in my unit substation?

Many new types, for example, can be installed without the use of vaults. There are even explosion-proof units (enclosed in an atmosphere of inert gas).

Is there adequate interrupting capacity in the switchgear at the unit substation?

Too many plants reserve this feature for the main high-voltage circuit breakers. Primary distribution deserves just as much attention. Interrupting capacity should be high enough not just for present loads, but for 195X loads.

Do I have modern instrumentation on the boards?

If you cannot afford all the instruments at the time the original gear is purchased, at least provide for later installation.

Am I timing my system improvements right?

You'd be smart to make the switch to high voltages and load centers when you have to replace obsolete switchgear, or need new substation capacity, or need new cables, or are installing new generating capacity, or are adding a lot of new load to your system. Perhaps the best time to modernize your electrical system is when major plant modernization is underway.

Have I worked out an installation schedule that will minimize downtime?

One trick is to install the new system over the old one, and cut in loads one by one. With load centers you can connect the high-voltage side and then take on one load after another until all the load is removed from the old system—and then dismantle the old system.

Should I include cable modernization?

Modernization of cable systems means looking to the roof. Overhead distribution is gaining popularity. Extra capacity can often be obtained merely by pulling out the old cables and replacing them with cables that have modern insulation, which permits operation at higher temperatures and, therefore, more current. The use of armored cables which do not require conduit but can be strung like "BX" in your home, is another modern technique which has paid off.

Should I avoid underground cable?

Yes, for many reasons. Underground dampness can hasten the failure of cable. Expansion of underground systems is next to impossible. If ductlines are encased in concrete, excavations must be made and new concrete poured. And it's tough finding underground cable failures.

Are the locations of my load centers carefully worked out?

You lose much of the advantage of load centers unless they are close to the loads they serve—that is, right in the center of manufacturing areas. This is high-priced space. Many companies are solving this problem by locating their load centers overhead—on mezzanines or balconies, in the trusses, even on the roof or in the basement. Main thing is to keep them out of the way of production.

. . . ABOUT YOUR SECONDARY DISTRIBUTION

Are voltages carefully planned?

Best bet for secondary voltage: 480 volts. You may want some higher voltage feeders (2300,

4160, or whatever your primary voltage may be) for large motors, other heavy loads. But chances are, 480 volts is the 195X secondary voltage. It gets the nod over the older, and common, 240-volt systems because it can deliver the same amount of power to the load with less current, and therefore less line loss. And the 480-volt components (substations, cable, motor starters, and the like) cost less than 240-volt components.

Did I remember that I could utilize much of my 240-volt gear if switched to 480 volts?

Many motors are rated 240/480 volts, and merely need reconnecting if you shift. And it's often possible to change over transformer connections without too great a cost.

Have I thought about using bus duct?

Modern distribution systems must be designed for flexibility. Production people must be able to move their equipment around freely. Power must be convenient. Especially where heavy concentration of machine tools are involved, a network of bus duct is rapidly becoming a *must*. Bus duct, which can carry 3000 amperes with ease, can also be used as feeders to carry power from the load centers to the mid-point of bus duct runs that feed machines.

Should I consider combining power and lighting circuits in one system?

Lately there has been much interest in high voltage lighting using 277 volts (obtained by tapping two lines of a three-phase 480-volt system). Fluorescent or mercury vapor lamps are used. The cost of this kind of lighting system can be low—in some cases only about 60% of the cost of a conventional system using lighting transformers.

If I consider 277-volt lighting, should I try to use present lighting panel switches?

They are only rated for 250 volts. Most 277-volt systems use motor starters to control the lights. In the office area you can use low-voltage switching, utilizing 24-volt relays. These relays can give you many possible combinations of switching (for example, controlling lights from three points) which are not possible with ordinary wiring.

Should I have a separate substation for welding loads?

This is a *must* if resistance welders are now causing light flicker, as they often do. Welders draw heavy current for short periods of time. They do not represent much power demand, since the duration of the current is short, but the voltage dips they cause are noticeable.

. . . ABOUT POWER FACTOR IMPROVEMENT

Have I tried to cut power bills by doing an adequate job of power factor correction?

Check your last few bills, and see how much you could have saved.

Could my present system take on additional load?

Yes. If you improve power factor. It works this way: A substation, rated 1000-kva., and operating at full load with a 70% power factor is actually putting out only 700 kw., or 938 horsepower. If the power factor is improved to 95%, the same substation will deliver 950 kw., or 1273 horsepower.

How can I attack poor power factor?

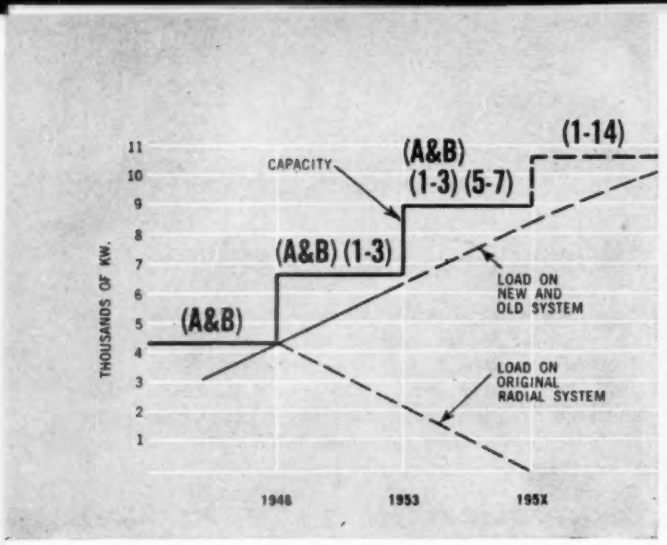
1) With capacitors. They can be added anywhere in your system, and can be moved around as conditions in the shop change.

2) With synchronous motors. To be effective, they must be in 150 horsepower class and up. So when you are buying this size of motor—for an air compressor, pump, fan, or blower, consider paying the additional cost of a synchronous motor. It may be offset by eliminating the need for a substation.

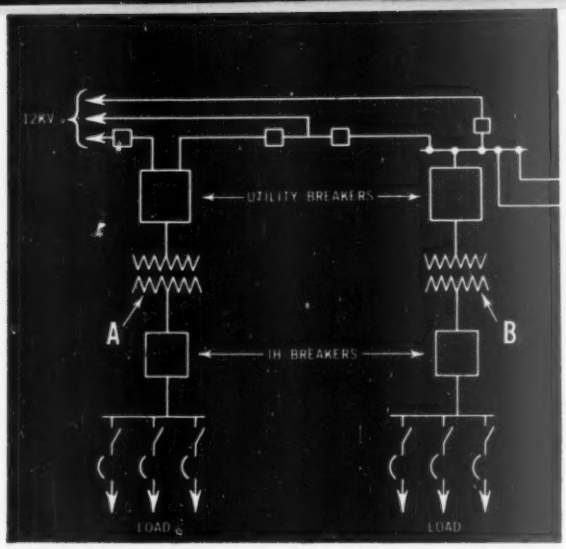
3) With correct loading of underloaded induction motors. This is the major cause of poor power factor. If your power factor is low, you'll be surprised at the number of induction motors in the plant that are only pulling half load. Swap motors around, get the right motor on the right load, and your power factor will go up without the need for any additional equipment.

YOU SAY: OK, I've read all about this "ideal" 195X electrical distribution. But it looks like the kind of system FACTORY is talking about could cost plenty. Are any companies going as far as you suggest here? FACTORY SAYS: They sure are! These ideas weren't "dreamed up" by us. Everything you've read about we've seen. Study the three case histories that follow. You'll find all three companies are a long way toward 195X electrical distribution—right now!

Now, for these three 195X success stories, turn the page



GRADUAL NEED FOR INCREASING CAPACITY caused by increased mechanization, switch to individual machine drives and heavy increases in welding load is shown on this chart. Letters and numbers on chart refer to transformers (numbered on figure at right) which supply the capacity.



BEFORE 1946 plant had a simple radial system, with no substations. Two banks of utility-owned transformers (*A* and *B*) reduced 12-kv. primary voltage to 480 volts. They are located just outside plant. They fed a total of 27 480-volt feeders which led in more or less straight lines to loads in their respective halves of the plant. Total capacity: 4500 kva.

Why the West Pullman Works

of International Harvester made a

Gradual Change from Radial to

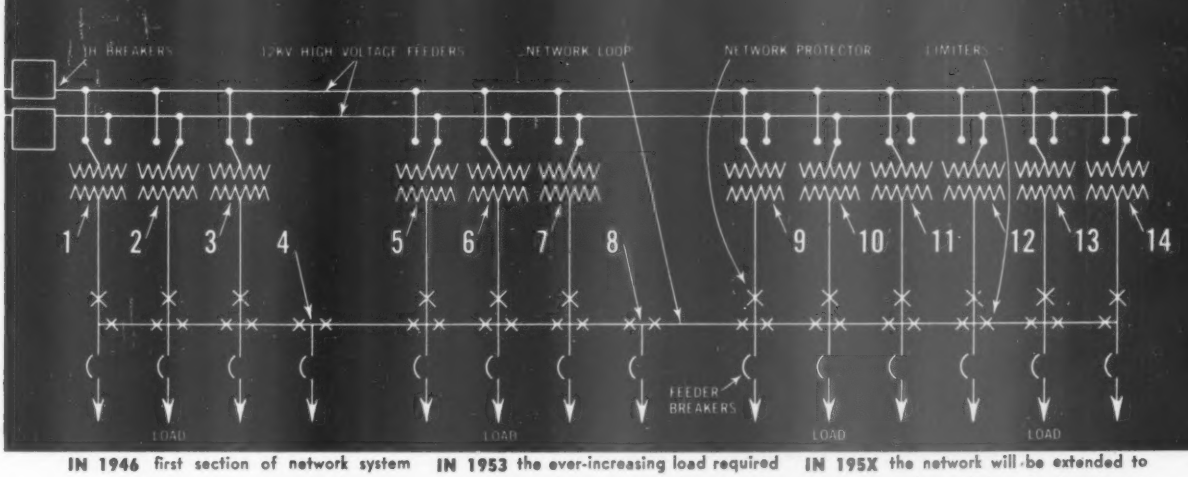
By KARL A. FAHSE • Supervisor, Electrical Engineering
Industrial Engineering and Construction Department
International Harvester Company, Chicago

SYSTEM DESIGNER: International Harvester Engineers

In 1946 it became obvious that we would have to do something about the electrical distribution system at our West Pullman works. As chart at left indicates, increasing power demands (caused largely by the installation of more machinery, a great deal of welding equipment, and replacement of belt drives with individual machine drives) had boosted the load to the capacity of the existing radial distribution system. After a great deal of thought we decided not to expand the radial system, which we considered inefficient and inflexible; but to install—in planned stages—a network distribution system. (Harvester is switching over to network in all 28 of its plants as the capacity of the existing system is reached).

Why did we switch to network? For the many advantages that networks offer over any other system. These will be discussed in detail on page C-12.

A SIGNIFICANT **MODERNIZED PLANT** TO GUIDE YOUR



IN 1946 first section of network system was added. Two high-voltage feeders were tapped off utility breakers. Both have capacity to feed entire network. But normally each feeds half the substations. First section consisted of three substations (1, 2, 3) and a "floater" (4). Load on new section: about 2200 kva. Radial system was left in operation, but its load was reduced.

IN 1953 the ever-increasing load required the addition of three more substations (5, 6, 7) and a second floater (8). The present load on this "combination" (radial and network) system is divided like this: on original radial system—2472 kw. (meaning that almost half of its 4500 kw. capacity has been relieved by the network); network (both 1946 and 1953 sections)—3966 kw.

IN 195X the network will be extended to its maximum by addition of substations 9 through 14, and addition of transformers to subs 4 and 8. And at that time the present radial system (transformers *A* and *B*, associated switchgear, and radial 480-volt feeder lines) will be removed and scrapped. The network will then carry the entire load.

Network Electrical Distribution

What is a network system? A glance at the chart above will help. High voltage is distributed through the shop to unit substations located throughout the plant. Here the power is transformed (in our case, to 460 volts) and supplied to nearby loads.

So far this is the same as a radial system with load centers. But there's an important addition: the 460-volt side of each substation is connected to the 460-volt side of the two adjacent subs by a network loop. This has the effect, electrically, of putting all the substations in parallel; and is the reason for the important benefits of this system.

Any disadvantages? One big one. Cost. We estimate the cost of a network system as 40% above the cost of a radial system with the same number of substations. The extra represents the cost of the conductors in the network loop, and the network protectors and limiters (that is, specialized circuit breakers).

Are networks strictly "big plant"? *No.* Although the plant described here has a husky 880,000 square feet, we've made similar installations in much smaller Harvester plants (down to 400,000 square feet), see no reason why the cost could not be justified in plants as small as 200,000 square feet.

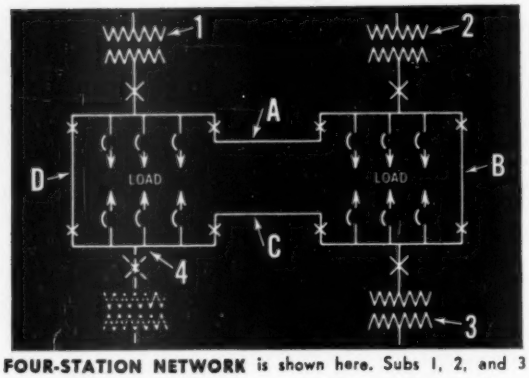
Needed: a master plan • Our first job was to figure the ultimate power demand in the building. Surveys indicated an ultimate demand of 10.5 volt-amperes per square foot. Since we have standardized on 750-kva. transformers, it's obvious that we required one substation for every 70,000 square feet of floor area. Accordingly, on a plot plan, the 14 unit substations we'd ultimately need were located on an average of 260-ft. centers. From that point it was a simple matter (for our electrical engineers) to figure the number and sizes of high- and low-voltage feeders.

Turn the page for benefits Harvester gets from its new network

Begins on page C-10

In switching from a "one main substation" International Harvester got...

... these benefits that only a network offers ...



FOUR-STATION NETWORK is shown here. Subs 1, 2, and 3 are complete units; number 4 is a "floater," a substation with no transformer, just switchgear. Its load is carried by the other transformers through the loop.

1. Reliability of service · This is number one in most user's books. For example, suppose the transformer in substation 2 (see above) fails. Without the network loop, the load served by this sub would clearly be out of action. But with the loop the other transformers in the system (1 and 3) supply the power to sub 2's load through the network loop (lines A and B). They can carry the overload long enough for repairs or replacement of the unit which is out of action. This diagram indicates an extreme case—only two units to pick up the load of the bad transformer.

In practice, all substations on the loop contribute to picking up the extra load, putting about 25% of it on those adjacent.

2. Load layout flexibility · Because of the "load sharing" feature of the network, it is possible to connect new or relocated loads directly to the nearest load bus, without worrying in the least about the load capacity of the individual transformer serving that bus. The only capacity that must be kept in mind: total capacity of all the transformers on the loop. Byproduct benefit: Secondary runs from load to supply can be much shorter than is typically the case with any radial system—not only saving copper, but cutting voltage losses as well.

3. Better voltage regulation · Again because all the transformers share the load, starting a heavy motor, for example, causes little disturbance to voltage in the shop. Voltage regulation made possible by this system is a much better-than-average plus or minus 2%. The regulation supplied by most other systems is 4%.

4. Capacity can be added as needed · In chart substation 4 is a floater. While the switchgear for the 460-volt bus and the network loop are in place, there is no transformer. The load is carried by power supplied from all the other transformers on the loop (though mostly by subs 1 and 3 through loop sections C and D). If the total load increases to the capacity of transformers 1, 2, and 3, a transformer can quickly be installed in sub 4, increasing total capacity by 33%.

Of course, it is possible merely to extend the bus ducts served by sub 1 into number 4's "territory," since the load would be shared instead of being thrown entirely on number 1. This would, how-

KEY CHANGES INVOLVED IN SWITCHING TO NETWORK

1 · Incoming voltage

Pre-1946: 12-kv.

Now: Same since 12-kv. is highest utility had available. I-H prefers 13.8-kv. or high for networks, where available. Should utility raise primary voltage later, they can arrange to transform to 12 kv. outside plant.

2 · Main substation

Pre-1946: Total of 4500-kva. transforming capacity in two banks: three 833-kva. oil-immersed units in one, two 1000-kva. units in the other. Utility and I-H both have breakers and disconnect switches on their sides of transformer. Metering on 480-volt side of transformers.

Now: Radial transformers, switchgear, and metering left in place to carry part of load. Two network system 12-kv. lines tapped off between utility breakers and transformer. Each feeder has its own breaker. When network is complete, radial gear will be removed and scrapped. Network metered on 12-kv. lines.

3 · Interrupting capacity

Pre-1946: Both utility and I-H breakers at main substation have 500,000-amp. interrupting capacity, adequate to handle the maximum current the utility supply could introduce in case of short circuits.

Now: Radial system protected as above. Main feeder breakers of network also have 500,000-amp. interrupting capacity. Network protectors, sectionalizing breakers, and limiters have 50,000-amp. interrupting capacity. This is adequate because, with the spacing of substations used in the system, the impedance of the high-voltage cables, transformers, and network loop insures that short-circuit currents are limited to approximately 50,000 amperes in the secondary circuit.

4 · Conductors

Pre-1946: 480-volt power feeders were mostly 3-conductor 500-MCM cables run through tunnels. They terminated in power cabinets or bus duct runs in all sections of the shop.

Now: Two 12-kv. feeders to substations

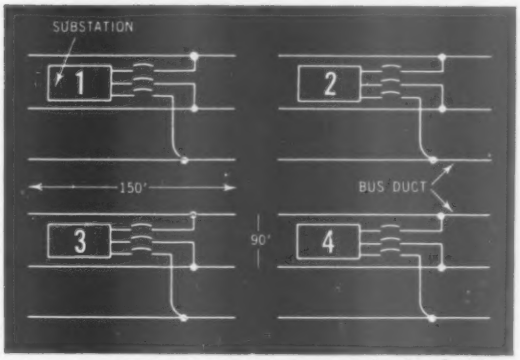
radial system to network,

. . . plus these load center benefits.

ever, be stretching the "share the load" feature of the system. Should the transformer with the double load fail, the others would be badly strained to carry the load. Further, there would be too many "eggs in one bus duct" in case a bus or load fault should occur.

Little downtime is required to add the transformer. Feeders can be de-energized alternately for connection to unit. Hook-up to low voltage requires only 30-min. shutdown.

5. Ease of maintenance · Any one transformer can be down for cleaning, repair, or replacement without disturbing any load. Or, in case of a fault on one high-voltage feeder, the entire load can be carried on the other. (This requires fast switch-over of transformers on bad feeder to remaining feeder. Until this is done, transformers on good feeder have 100% overload.) In general, the continuity of service provided by the network allows maintenance men time to locate and repair faults with a minimum of, and often no production loss.



BUS DUCT LAYOUT for a typical group of unit substations. High-voltage feeders and network loop omitted for clarity.

1. A source of power instantly available within a short distance of any load. The diagram above illustrates this. Most of the bus duct runs are on 90-ft. centers, so few loads are further than 45 feet from a source of power.

2. Line loss is held to a minimum, since all long runs through the shop are high voltage.

3. The system is easily expandable · Assuming the high-voltage feeders have adequate capacity (the case except for complete miscalculation of ultimate load), additional substations can be added at will. With a "one main transformer" radial system, expansion can cause one of two big problems. At the least, long low-voltage lines have to be run from the transformer to the load.

And if the transformer doesn't have enough capacity to take on the new load, duplicate equipment is required—and this can be mighty expensive.

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consist of three single or one three-conductor 400-MCM 15-kv. class cables. Run underground, they come up through manholes, run in conduit to substations, which are located overhead. 460-volt network loop consists of two 3-in. conduit runs each with three 500-MCM, 600-volt-class cables installed in trusses. 460-volt power feeders are same, terminate in a tap box where they are connected to 600-amp. plug-in bus duct for distribution of power to load. Any bus in old radial system is incorporated in network system.

5 • Load centers (unit substations)

Pre-1946: None.

Now: Six now in, eight more to come. All substations are installed overhead in trusses. Since they are air-cooled, they are light enough for truss installation, and much more easily maintained.

6 • In-plant voltages

Pre-1946: 480-volts, to insure 440 at load.

Now: Because of close spacing of substations, and good voltage regulation of network, 460 is used as transformer secondary voltage. I-H saw no point in any basic change, since all existing plant rotating equipment was 440-volt type.

7 • Lighting

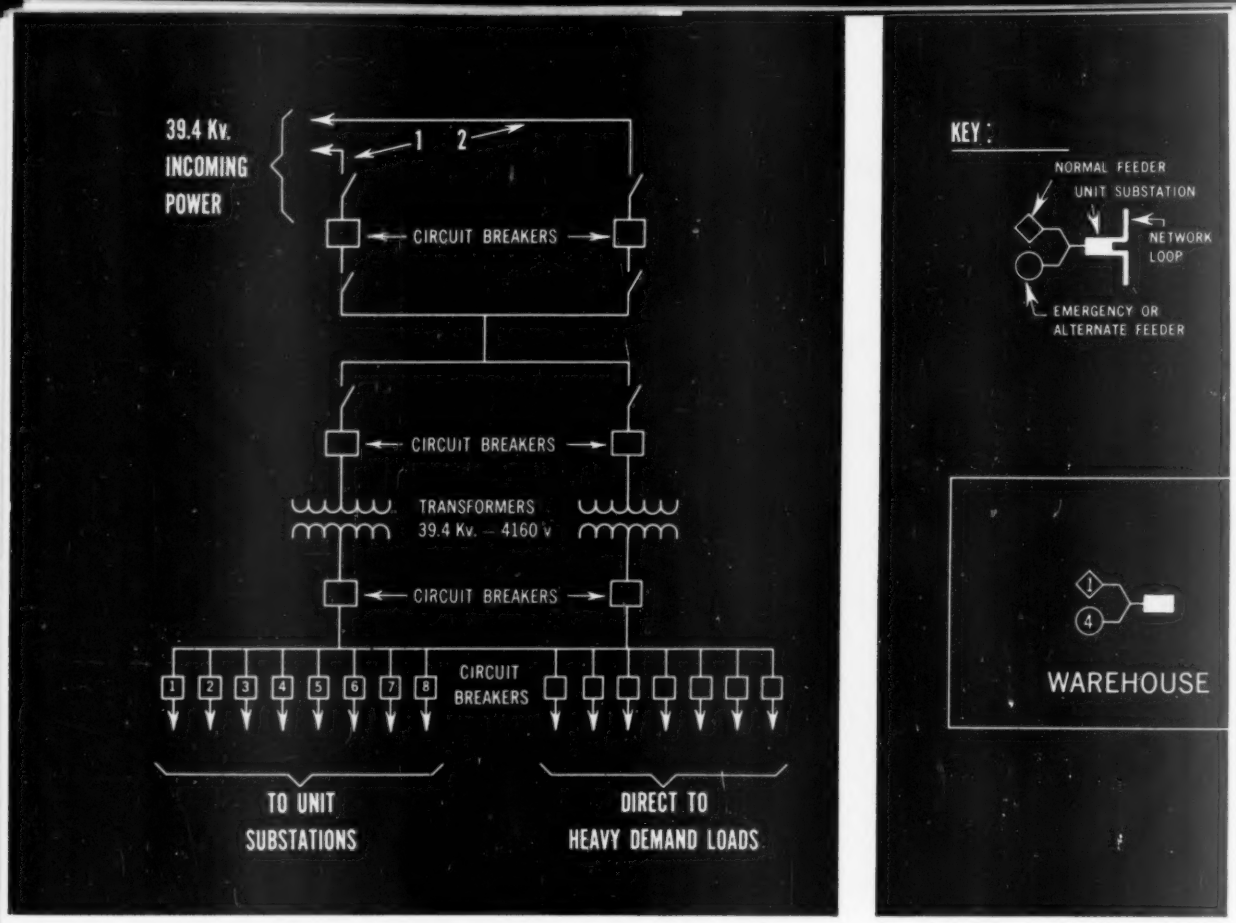
Pre-1946: Separate 480-volt power feeders run from main transformers throughout shop to 250-kva., 480:120/240 oil-immersed transformers, each of which served about 225,000 square feet.

Now: Transformers supply 14,500 square feet of fluorescent lights; are fed from bus duct system through circuit breaker plugs. Circuit between a breaker and transformer consists of 3 #8 wires in 1-in. conduit. Transformers are 25-kva. capacity, air-cooled, dry type, 460 volts: 123/213 volts (for maximum efficiency at present spacing). 19-kva. maximum lighting load per transformer, leaving 6 kva. for portable power tools, etc.

8 • Power factor correction

Pre-1946: Used capacitors.

Now: Capacitors still used, but need for correction much greater. Correction applied only when transformer capacity is being approached, or when cost comparison proves benefit.



PROTECTION AGAINST POWER FAILURE is provided by dual feeders for 39.4-kv. incoming power. If normally used feeder (1) fails, system is automatically switched to alternate (2), or vice versa. Transformers and switchgear are now only half loaded—leaving plenty of capacity for future demands.

An Electrical System That's

NAME: Westinghouse Electric Corporation
LOCATION: Columbus, Ohio
PRODUCT: Electrical appliances
EMPLOYEES: 7000 at capacity
DESIGNER AND BUILDER: Ebasco Services, Inc., New York

Here are eight reasons why the electrical system at the new Westinghouse plant in Columbus is a 195X system:

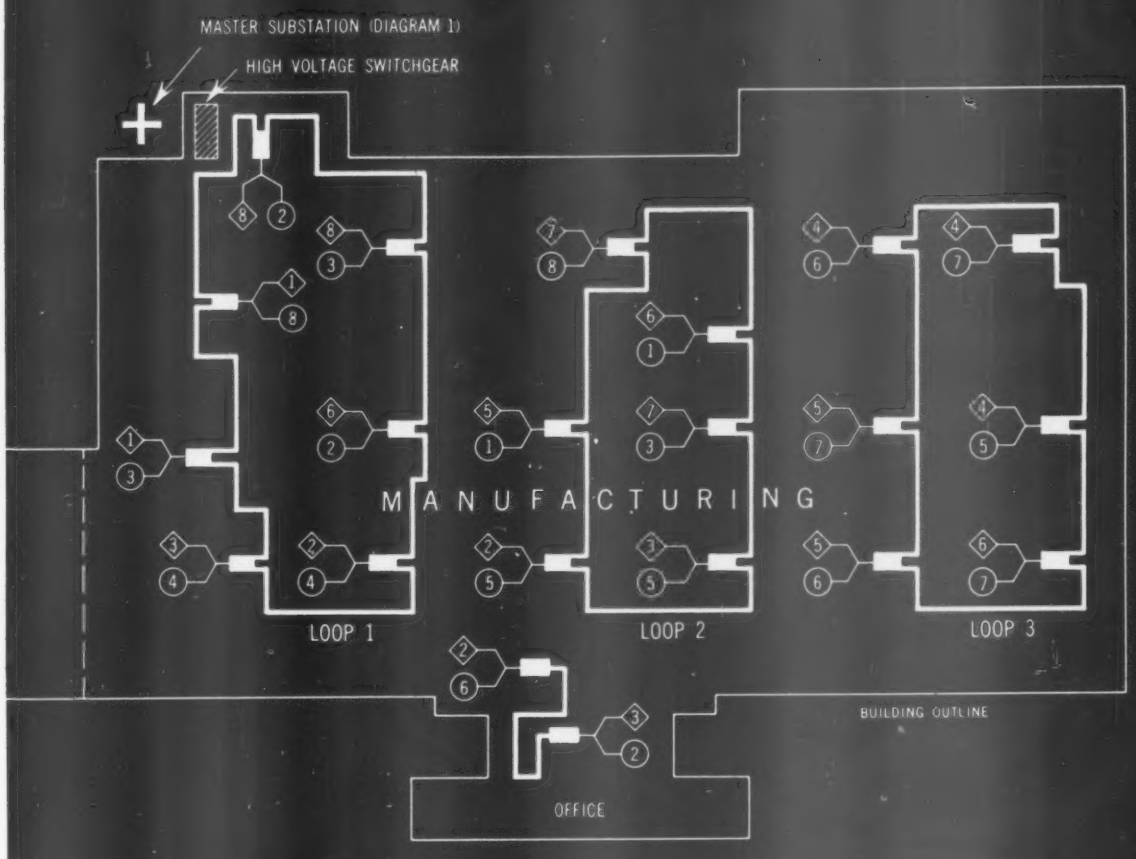
1. It has enough capacity. Planners studied load per square foot for all types of operations in other company plants, based capacity in this plant on those studies, added plenty of extra capacity for future.

2. It's flexible. Present bus duct layout has adequate coverage of plant to allow almost any change in production layout. But extra capacity means that plenty of additional bus duct can be added, or the bus duct layout can be changed, at minimum cost.

3. It keeps production downtime to a minimum. System is so designed that failure of any component of the system, or failure of a power company feeder, will affect production very little.

4. It has the right protective devices to insure its components against

A SIGNIFICANT NEW PLANT TO GUIDE YOUR



EXTRA CAPACITY AND BUILT-IN FLEXIBILITY are provided by plenty of substations (23 in all), and a bus duct network (not shown) so complete that no major load is farther than 40 feet from a bus. Substations have enough capacity to take on any possible plant load. Each substation has a normal (in diamond) and alternate (in circle) 4160-volt feeder. And each is connected to one of three network secondary loops. The result is excellent reliability.

Ready for Anything in 195X

damage caused by any fault within the system.
5. Its voltages are properly selected to permit the use of production and plant equipment from any company plant, should transfer of that equipment to this plant be necessary or desirable.
6. It accommodates the 15,000-fixture lighting system with ease, can take more load if needed.
7. It's economical to operate. The system holds line losses and voltage drops to a minimum.
8. It's easy to maintain. All components are accessible and the system is designed so that removal of components from the line results in a minimum of disruption to production, often none at all.

Here's the problem Westinghouse faced · How would you solve it?

Suppose you had plans for a dual-purpose plant. "As much space as necessary" is to be devoted to jet engine component manufacture; the rest to appliance manufacture. The long-range aim: to make this the best major appliance plant in the industry. But the plant must be ready for a switch to 100% jet engine manufacture any time, on short notice.

Sounds like a tough job to design the electrical distribution system for a plant like that? Sure. It was a toughie. But the job got done. To see how, take a look at the diagrams above.

Now turn the page for the story

How Westinghouse solved five basic electrical problems

PROBLEM 1 · HOW MUCH POWER—AND WHERE?

Westinghouse planners knew that they had to start with a reliable and convenient source of power. So they selected a tract for the plant that was only one-half mile distant from a utility loop circuit.

But the big question remained unanswered: How much power were they actually going to need? Finding the answer looks deceptively simple. The physical size of the plant was first determined. Then the amount of space allocated to manufacturing, warehousing, and offices was defined. From this basic information, surveys were conducted to determine how much electrical demand would be required per square foot of area, based on similar types of operations in other plants.

This took some real doing, because at this point they did not know what appliance lines would eventually fill the entire plant. (In fact, right now they are still looking into the crystal ball for some of these lines.) In addition, the amount of power for the manufacture of jet engine components had to be estimated and taken into account.

PROBLEM 2 · WHAT VOLTAGES—AND WHY?

At this point the selection of primary and secondary voltages had to be made. With a gross plant area of over two million square feet (plant building is over 2000 by 900 feet), power losses because of too-low distribution voltages could be substantial. Yet there were limiting factors on just what voltages could be used. It was necessary to match voltages to various types of equipment that would be transferred from other Westinghouse plants to Columbus.

Primary distribution finally selected was 4160 volts. This served to keep long cable-run voltage losses to a minimum. In addition, there were many large motors and welding machines that could utilize the high voltage efficiently.

At this time the important operating decision was made to purchase all motors above 125 horsepower for 4160-volt operation.

Secondary distribution voltage selected was 216/125 volts. Although the trend of secondary voltage is to 480 volts and higher, 216/125 volts was selected to allow complete interchangeability of production and plant facilities from other plants to Columbus. Since the plant already houses approximately 25 million dollars of production and plant equipment—new and transferred from other plants—it was the only practical answer. Plant conditions prevented the utilization of a higher voltage from paying off.

With the voltages and total power under their belts, the engineers began designing over-all system components.

PROBLEM 3 · THE MASTER SUBSTATION—WHAT SHOULD IT BE?

It had to be big enough. And in the event the designers missed their guess, allowance for expansion of the substation had to be (and was) incorporated in their design.

Transformers. The result was two 7500-kva., 3-phase transformers making a total capacity of 15,000 kva. For less than 10% extra, the transformers were equipped with fans, which brought the combined capacity up to 18,750 kva. — an increase of 25%.

Feeders. The big question here was how to make the best use of two incoming feeders that brought 39,400 volts to the plant. Company engineers wanted complete protection against delays due to power line outage. An automatic system was installed so that a loss of voltage on either feeder will automatically effect a transfer to the other line. The equipment is also arranged so that restoration of voltage to the original line will cause a re-transfer to the other line either manually or automatically.

Oil circuit breakers. They must have adequate interrupting capacity to interrupt overloads and protect themselves, the main transformers, and cables. Oil circuit breakers having an interrupting capacity of 1.5-million kva. were selected

for protection against excessive short-circuit currents from the incoming power lines.

Linear couplers were also incorporated into the incoming feeder system from the line side of the first breaker to the load side of the second breaker. They protect from faults all equipment between them, especially the interconnecting bus, by tripping the breakers and isolating the bus. With the bus de-energized the fault can be cleared. Linear couplers are simply transformers that transform the bus current to a voltage proportional to the current. An unbalance of bus current caused by a fault produces a change in voltage. This change energizes relays that open the breakers.

Voltage regulation is not just a help; it's *essential* in the modern plant. Electrical equipment, such as motors, lamps, heaters, is designed to operate best at rated voltage. Yet the best distribution system will suffer from fluctuations in supply voltages and from plant voltage losses.

To (1) get continuous voltage regulation, (2) relieve the operators from the chore of manual regulation, an automatic tap changer is incorporated in the transformer units. The voltage can be changed, ±10%, in 32 steps, under load.

PROBLEM 4 · MAIN SWITCHGEAR AND UNIT SUBSTATIONS—HOW MANY?

Getting the answers was not easy. Remember that complete production plans for the entire plant were not then defined. So the only practical approach was to cut up the manufacturing areas (on layout drawings) into logical production units and then use the demand per square foot figures already computed to determine each area's needs. The result was 23 unit substations, all 750-kva. capacity.

The indoor main switchgear consists of eight air circuit breakers serving the 23 unit substations and seven more serving high voltage equipment such as air compressors, motor generators and welders. (The number of 4160-volt air circuit breaker units needed is related to the number of items of equipment selected for 4160 volts—such as motors over 125 hp.—and to the number of unit substations.)

Nothing has been left to chance where safety of equipment is concerned. For example, the 15 air circuit breakers are backed up by two main air circuit breakers. These are electrically operated by 125-volt d-c control and are interlocked with the corresponding outside oil circuit breaker. When a fault occurs either in the transformers or in the 4160-volt feeders, both the main oil circuit breaker and its corresponding main air circuit breaker are tripped. This permits isolation of this feeder circuit so that the fault can be repaired.

Another interesting feature is that the main switchgear is located in the power house. No partitions or walls separate it from the main operating floor of the power house. Because of this accessibility the number of watch engineers required to operate both departments is reduced.

PROBLEM 5 · HOW TO GET REALLY RELIABLE AND BALANCED DISTRIBUTION.

Primary distribution. To offer top reliability of 4160-volt service to the unit substations a selective radial system was selected. It provides a means for reducing the duration of an outage resulting from a feeder fault. In this system arrangement, duplicate feeders are carried to each unit substation, where a manual selector switch makes it possible to connect the unit substation to either of the primary feeders.

For balanced distribution a normal and alternate feeder was established for each unit substation. These are shown as diamond- and circle-shapes in the illustration on page C-15. In normal operation each high voltage air circuit breaker and its associated feeder serve three unit substations. A failure of the normal feeder would transfer the load of each of these three unit substations to the alternate feeder. The result would be adding an additional unit substation load to three other feeders. The feeders are large enough to carry the additional load until the faulty feeder is repaired.

Secondary distribution. To provide continuity of secondary service, a network system consisting of three loops was set up for the manufacturing areas (see illustration, page C-15). No single fault anywhere on the system will interrupt service to any load. Each network is set up to provide an uninterrupted supply of secondary power even if a 4160-volt feeder is lost or a secondary transformer fails. All secondary unit substations have their low-voltage sides tied together in a loop (or network). Each transformer feeds into the secondary network through a network protector.

The purpose of the network protector is to protect the secondary loop and the loads fed from it against transformer and primary feeder faults by disconnecting the defective feeder trans-

former unit from the loop when current flows in the opposite direction. It is a specially designed air circuit breaker controlled by network relays. It automatically opens or closes in relation to power flow.

Added features of the network system: 1) The load is shared collectively by the system. 2) It provides exceptionally uniform and good voltage regulation. 3) Its high efficiency materially reduces the cost of losses. 4) Its flexibility offers minimum cost to meet changing and growing load conditions; and this is done with a minimum of interference with normal operations of the plant.

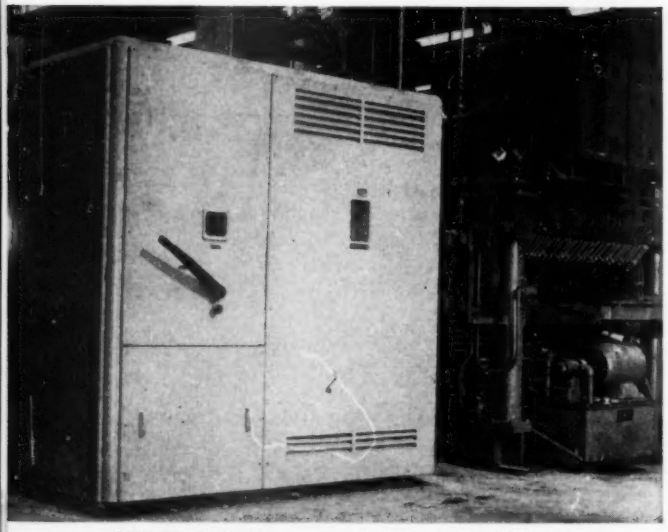
Protecting the system against faults in the loop cables (between each unit substation) was not overlooked either. Each individual loop cable is connected on each end to a limiter. A limiter is a device for disconnecting a faulted cable from the unit substations. It is like a fuse, which is heated and destroyed by excessive current passing through. Air circuit breakers (manually operated) are used in front of each limiter in order to permit positive isolation of cables for repair.

The warehouse unit substation is not connected to any network since it only serves lighting circuits. It is equipped, though, for future network service.

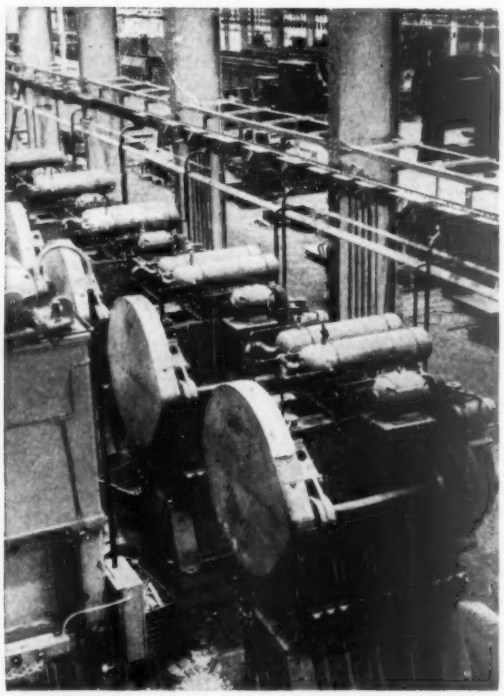
The main office area is served by two unit substations. One unit is located adjacent to the heating and air conditioning equipment, and the other is adjacent to the fully-equipped stage. The secondaries of these two units are tied together, giving excellent voltage regulation at the peak demand of the separate facilities. These peak demands, however, will not occur at the same time.

Unit substations are located right out in the manufacturing area where needed. But to per-

Here is some of the special equipment that makes this a



POWER CENTERS are used where large blocks of power are consumed by a single production machine. They are tied into the 4160-volt service and are equipped with a transformer to reduce the voltage at the machine location. This permits moving the power center with the machine. It also reduces line losses and voltage drops. The unit above serves the back-sheet welder next to it.



BUS DUCT is used extensively throughout the entire manufacturing area. Advantages: simple to install, components can be reused, system can be rearranged (added to, subtracted from, or relaid out) with a minimum disruption of service, makes possible complete flexibility of production equipment layout.

mit freedom of plant rearrangement they are on specially built mezzanines, roofs, and in recessed walls.

Bus duct. Next came the big problem of how to get the secondary power to grid the entire manufacturing area, yet get the advantages of inexpensive installation and enough flexibility to permit alterations resulting from constant changes in floor layouts.

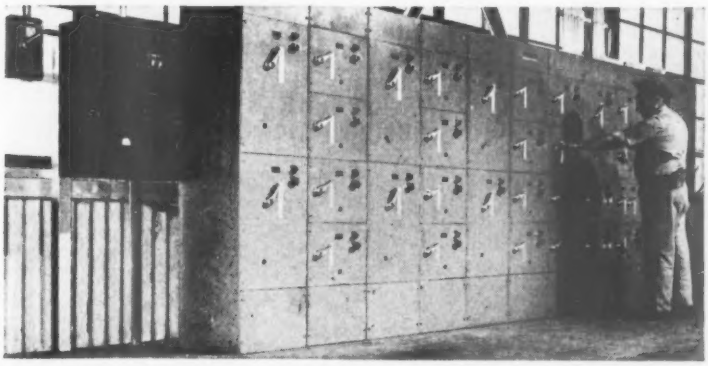
The only practical answer was plug-in bus duct. 10,100 feet was installed covering the entire manufacturing area. Some is also used in office areas. In the shop, no machine is more than forty feet from a bus duct.

Electrical devices such as safety switches, circuit breakers, are plugged into bus duct plug-in openings, spaced 12 inches apart on alternate sides of the bus duct. Simple conduit runs carry the power from the plug-in device to the motor controller of the machine. Sliding covers fit snugly over plug-in openings when plug-in devices are not in place.

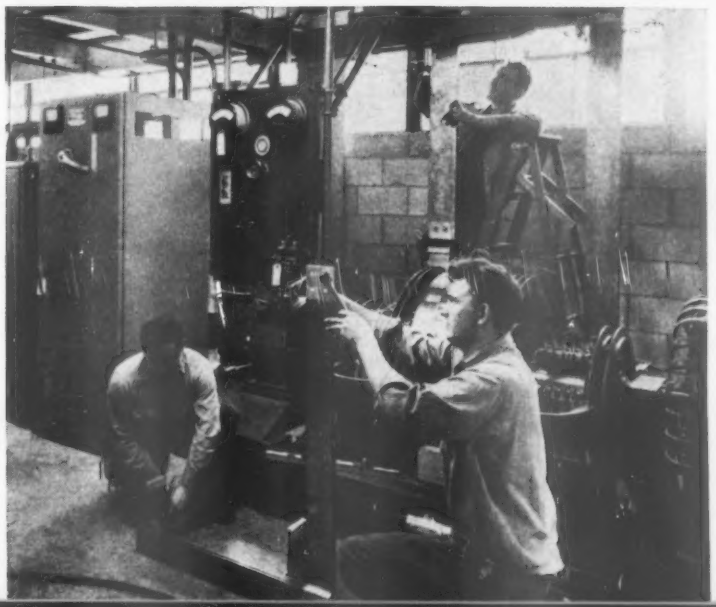
Another outstanding feature of bus duct is that its components can be reused with minimum of labor cost and practically no new material cost.

Lighting circuits are fed directly from the unit substations. Since the unit substations are located throughout the plant, they serve as a convenient source of power to lighting panel distribution boxes throughout the building, thus reducing runs to each lighting center. Also by being tied into the secondary networks, they are not disturbed by voltage drops. Manufacturing working areas are lighted to an intensity of 50 foot-candles; non-work areas are lighted to 15 foot-candles. Lighting circuits are so arranged that aisles and other important areas can be controlled separately without having to light the entire area.

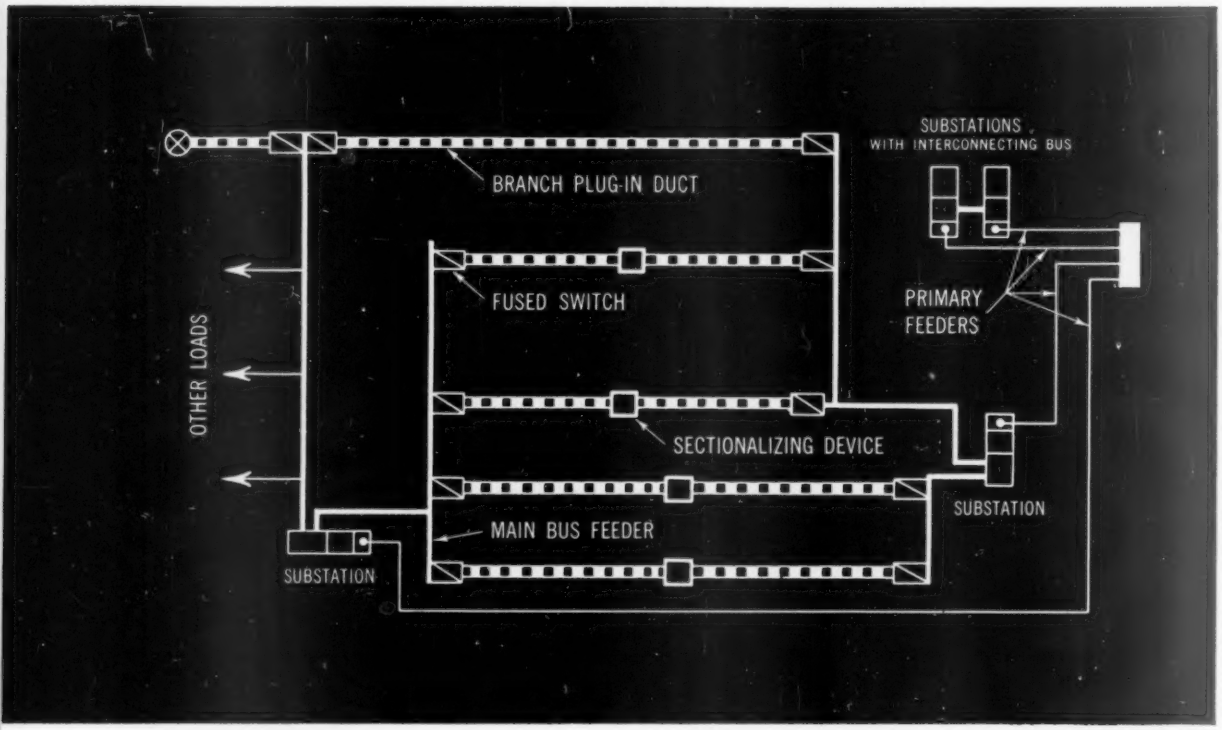
195X system



MOTOR CONTROL CENTERS are used where many motors are installed in groups, and where motor locations will not change. They reduce the initial cost of installation, are compact and neat in appearance, lend themselves to easy expansion, provide central operation and maintenance advantages. The control center shown here serves motors in the powerhouse.



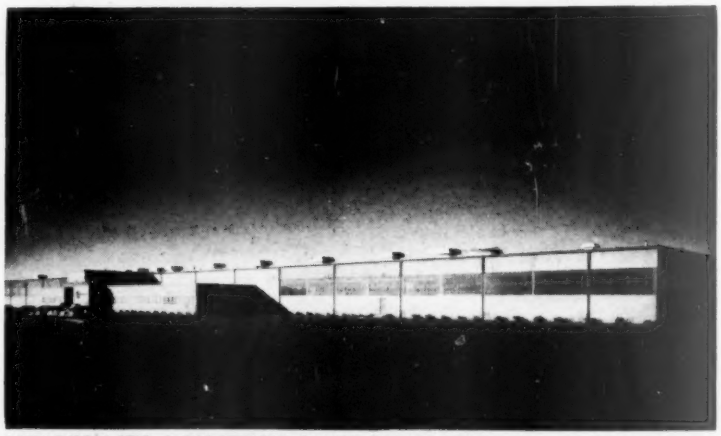
THIS 4160-VOLT MOTOR is one of several in plant. All motors above 125 hp. are tied directly to the 4160-volt line. Advantages: economical use of power and reduced line losses.



THIS BUS DUCT NETWORK covering the manufacturing area guarantees flexibility of production equipment layout. Note the unusual feature: sectionalizing devices in each bus-duct run which permit shifting the load from one substation to the other —for flexibility and reliability. The two substations at the upper right serve heavy concentrated loads.

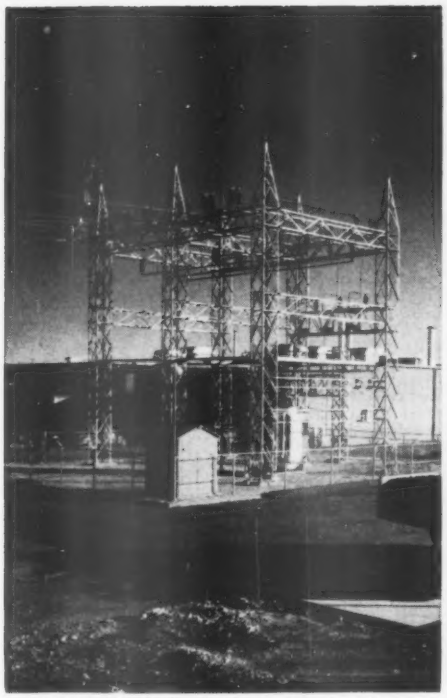
Three of the main features ↑ . . . . . in Chicago Pneumatic's new plant ↓ . . .

NAME: Chicago Pneumatic Tool Company
LOCATION: Fort Worth, Tex.
PRODUCT: Oil well drilling bits and accessories
EMPLOYEES: 500
ENGINEER AND BUILDER: Walter Kidde Constructors, Inc., New York



ALTHOUGH IT'S A RELATIVELY SMALL POWER USER, this new plant has lots of 195X features in its electrical distribution system. The connected load is 5400 kva.; initial plant load, 2700 kva. Plant is located in Fort Worth.

A SIGNIFICANT **NEW PLANT** TO GUIDE YOUR



MAIN SUBSTATION is fed by dual feeders, for greater reliability. Its capacity is adequate for considerable future expansion.

ALL UNIT SUBSTATIONS have almost double presently needed capacity; are located on mezzanines, out of the way of production. Silhouetted against window is one of five bus-duct runs, with plug-in switches.

. . . show you how a . . .

Small Power User Plans for 195X

Chicago Pneumatic took advantage of these important 195X trends in planning its system:

- High-voltage primary distribution
- High-voltage lighting
- Unit substations
- Plug-in bus duct

Advantages of the system:

- Simple
- Ample flexibility
- Capacity for future growth
- Economical to operate
- Low in initial cost

There are lots of plants that don't use big chunks of power. Can 195X thinking be geared to the needs of these plants that use less than, say, 5000 kva.? It sure can!

Chicago Pneumatic Tool Company's new plant is in that group. And when company engineers designed the electrical system for the plant, they built in many of the features that we're calling "195X." To get the features listed at left took careful planning, and some compromise; including the undertaking of some calculated risks with continuity of service. And they realize that major expansions in the future might call for further expenditure. But they've got what they wanted: a good basic system—at low cost.

For details of design, and some of the special features of the system, turn the page.

The design and some of the 195X features — of Chicago Pneumatic's electrical system

1 · The main substation (pictured previous page) is a single 5000-kva. transformer, installed by the utility. Dual 60,000-volt feeders insure a reliable source of power. Voltage is reduced to 2400 volts for in-plant distribution.

2 · The outdoor switch rack is owned by Chicago Pneumatic. It consists of four vertically mounted, fused air-break switches, has two spare positions for future switches.

3 · Underground feeders, in conduit, carry the 2400-volt power from the switch rack to a junction box in the building. Four conduits are now in use, and two spares are in place for future needs. From the junction box, power is supplied to the unit substations by 5000-volt class overhead feeders.

There are no gold-plated features in the primary distribution system. There is only one feeder to each unit substation. This means, of course, that in the event of feeder failure, a new cable will have to be installed. Even with spare cable on hand this will take a couple of hours. And production will, of course, be lost. Company management weighed this risk against the cost of dual feeders, and decided that the disruption of production would not be serious enough to justify the cost of providing dual-feed reliability. In other words, they took a calculated risk to hold down the initial cost of their system.

4 · Four 1000-kva. unit substations supply enough capacity for 195X needs. The transformers are the Askarel type, reduce the voltage from 2400 volts to 480/277 volts. Two of the units are located side by side, serve the concentrated loads of the welding and heat treating departments. The other two units (about 400 feet apart) serve the manufacturing area. One is pictured on previous page.

These four unit substations have plenty of capacity for future expansion. Careful estimates put the initial plant load at 2700 kva. (connected load is 5400 kva.). The four unit substations have a rated capacity of 4000 kva., and provision has been made in the units for the addition of fans, which will increase each unit's capacity to 1150 kva.—for a total of 4600 kva. This is 1.7 times the present load. Since the national trend has been a doubling of power demand every 10 years, it appears there is the capacity here for 195X needs.

A great deal of flexibility is built into this simple system. The two side-by-side unit substations that serve the heat treating and welding departments are connected, on the secondary side, by a bus and tie-breaker. In the event of feeder or transformer failure at either substation, one can carry the essential loads of both.

The other two unit substations, serving the general manufacturing area and the lighting system, are not tied together by a bus tie arrangement. However, the load fed by both these unit substations can be shifted from one to the other by a clever arrangement of tying bus duct together (see next paragraph).

5 · Plug-in bus duct supplies power, at 480 volts, to the entire manufacturing area. The bus not only feeds production machinery, but also:

1) Several transformers required to provide miscellaneous power at 120 volts.

2) The lighting system.

As mentioned above, there's an unusual feature built into the bus system for shifting loads between substations—and thus providing better-than-normal flexibility and reliability. Here's how it works (a look at the bus duct diagram on previous page will help).

The main bus duct feeders (800-amp. capacity) are run across the building from the two substations serving the manufacturing area. These end-feed five plug-in, 400-amp. bus ducts, running the length of the manufacturing area, between the main feeders (about 400 feet). These bus ducts are protected, on each end, with 400-amp. fused switches. And—here's the feature—all but one of the five bus runs is equipped with a sectionalizing device to permit shifting the load between substations.

These devices are simply insulating spacers that may be inserted between phase bars in the bus duct, at any joint.

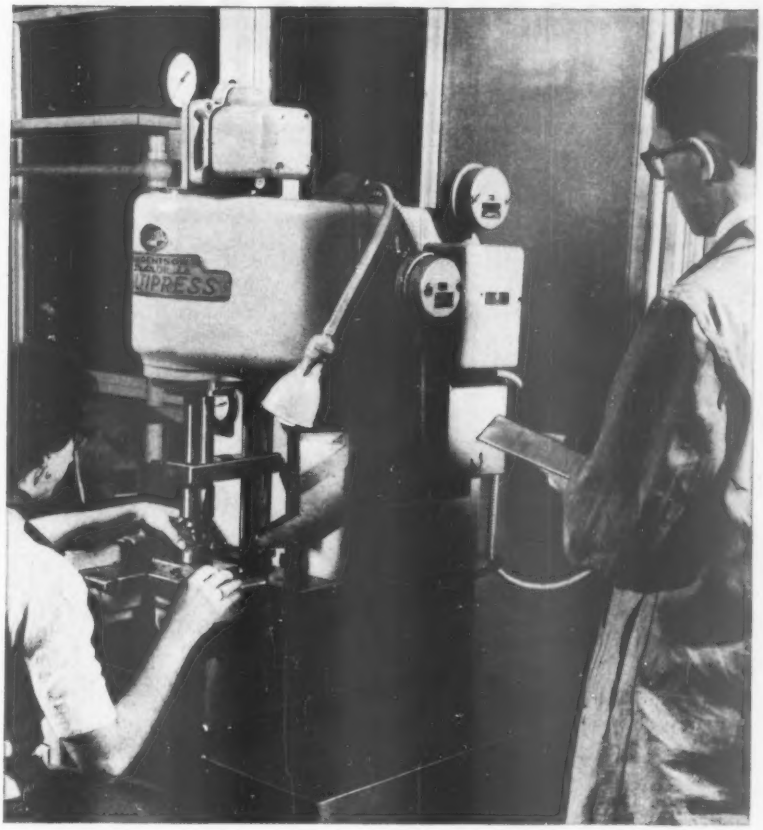
6 · The 277-volt lighting is another 195X feature. It was selected to further reduce initial cost, and with an eye toward economical lighting operating costs. 277-volt lighting effects savings in branch circuit wiring and panelboards, eliminates the need for transformers to reduce power to 120/208 volts —required by normal lighting systems.

7 · The system is grounded for three reasons:

1) To help in locating ground faults.

2) To minimize transient overvoltage that may occur in an underground system.

3) To minimize damage to insulation that can result from a ground fault in an ungrounded system.



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Metered Time is your record of actual and potential machine performance, collected by use of a General Electric elapsed-time recording meter. Here is how Metered Time helps you:

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From Metered Time records, you can learn the exact time your machines actually operate. If only 10% or 20% a day, their idle hours are costing you money. By correcting the cause, you reduce idle time, allow machinery to produce a full work day, frequently make one machine do the work of two.

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With Metered Time records, you can plan a maintenance schedule for repair work to be done after hours at predetermined intervals—before trouble occurs. Inspection costs are decreased, maintenance shutdown time is minimized, every minute of valuable operating time is available for production work.

GENERAL ELECTRIC KT TIME METERS

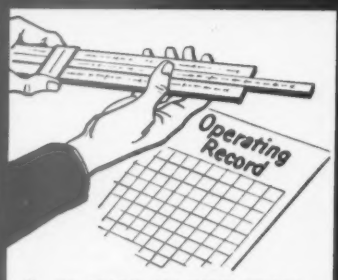
The G-E KT time meters are easily and quickly installed on your electrically operated machine tools to provide accurate records of operating time.

FOR MORE INFORMATION

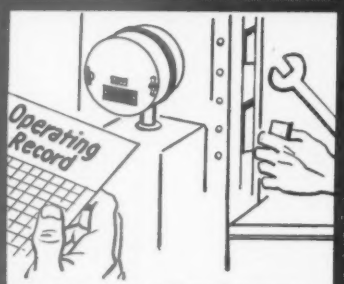
Contact your nearest G-E Apparatus representative or write for Bulletins GEA-5965 and GEC-472 to Section 603-173, General Electric Company, Schenectady 5, New York.

HOW TO USE METERED TIME RECORDS

1. AFTER INSTALLING General Electric KT time meters on machine to be studied, record the operating time over typical work period.



2. TO LEARN MACHINE UTILIZATION, divide operating time by total elapsed time; if utilization is low, find and eliminate the cause.



3. TO PLAN MAINTENANCE SCHEDULE, record hours machine has operated, study repair records; base schedule on operating time.

4. THIS MAINTENANCE SCHEDULE thus obtained aids in increasing machine life and helps substantially reduce your maintenance costs.

GENERAL ELECTRIC

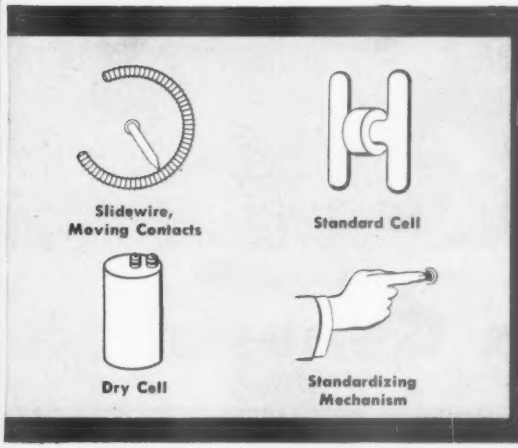
General Electric Announces

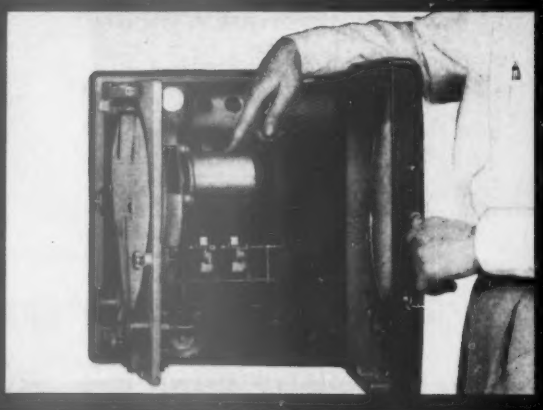
A New Recording Controller

REVOLUTIONARY MEASUREMENT-CIRCUIT DESIGN ELIMINATES MANY TROUBLESOME COMPONENTS

General Electric's new d-c recording controller assures you of having less maintenance by eliminating conventionally used dry cells, standard cells, slidewire and sliding contacts. Replacement costs for dry cells, or worn, corroded electrical contacts are gone, and your savings increase with the exacting control of this new instrument.

THE MAGNETIC STANDARD provides truly continuous standardization in new G-E recording controller and the measuring circuit incorporates the high stability of a permanent magnet for a reference standard. Loss of measurement and control can never be experienced, during standardization periods, with the constantly balancing G-E system. Your end-product quality, under the effects of increased accuracy and precision of measurement, will reflect even more cost and time savings in your operation.





By eliminating the above components, the new G-E potentiometric recording system reduces maintenance time (at no extra cost) and excludes such time-consuming jobs as replacing dry cells, or cleaning moving contacts.

Condensed size through unit construction makes the new Magnetic Standard easy to service. The controller has a maximum number of plug-in parts to facilitate range changing in the field. No unsoldering is required.

See this and other G-E instruments at the Instrument Society of America Show, September 15-21, Commercial Museum, Philadelphia, booths 531-537.

SECTION A602-276
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Please send me a free copy of the new bulletin, GED-2100, which features the New Recording Controller in a colorful, twenty-page picture story.

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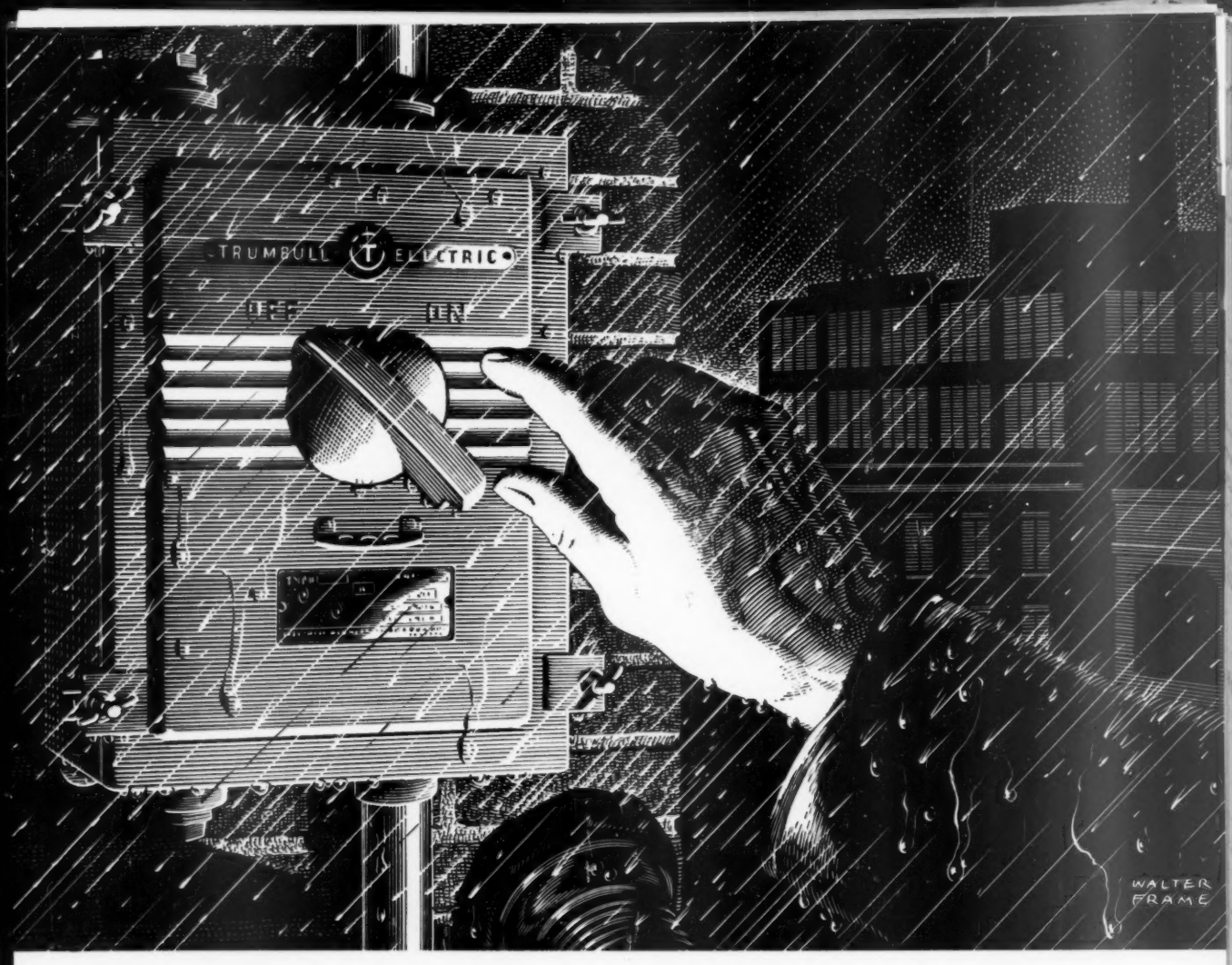
GENERAL ELECTRIC



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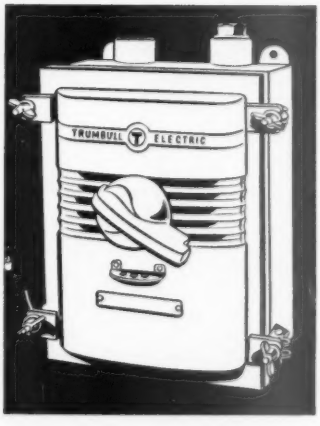
Water-tight and dust-tight (NEMA 4 & 5) lead plated, sheet steel enclosures are available immediately through your General Electric-Trumbull Distributors. Safety switches 30 through 200 amperes; circuit breakers 15 through 225 amperes.

Inspect this important new General Electric development before your next switch or circuit breaker order. Write, wire, or phone General Electric Company, Trumbull Components Department, 46-61 Woodford Avenue, Plainville, Connecticut.

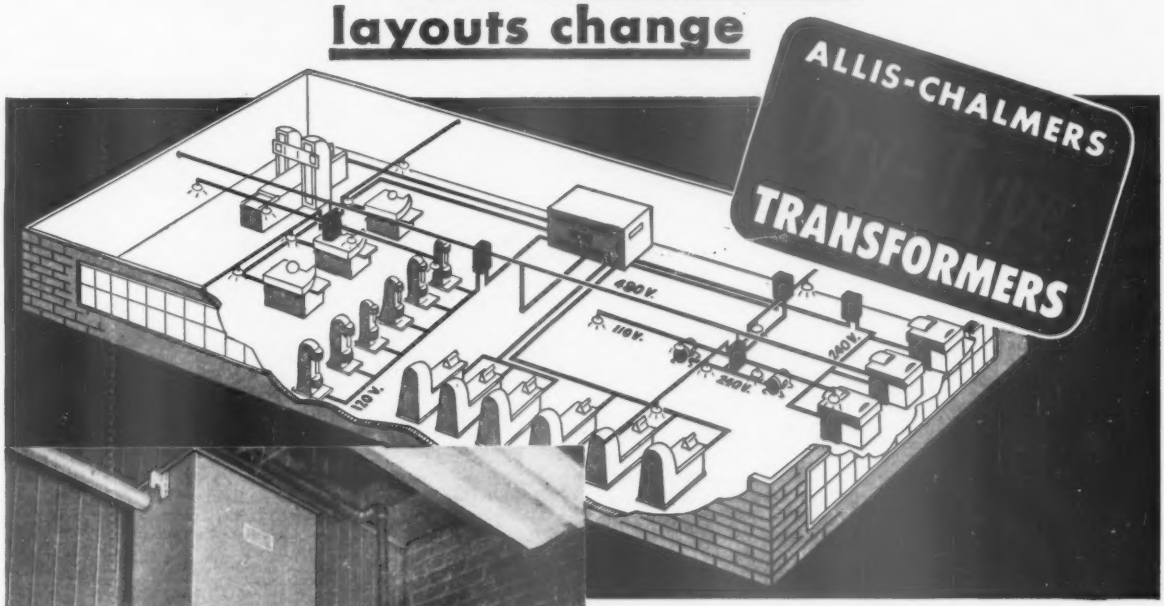


You can put your confidence in—

GENERAL ELECTRIC

Get Flexibility Like This

for lighting and machine efficiency even when plant layouts change



Low Installation and Operating Cost

Allis-Chalmers dry-type transformers require no expensive vaults. They are safe and clean. They've been designed to fit into modern plant layouts — they are lightweight and easy to handle. There are no gauges to check, no liquids to handle. All you need is routine inspection. Ratings are single-phase, sizes 15 kva and larger; three-phase, sizes 30 kva and larger, 15 kv and larger.

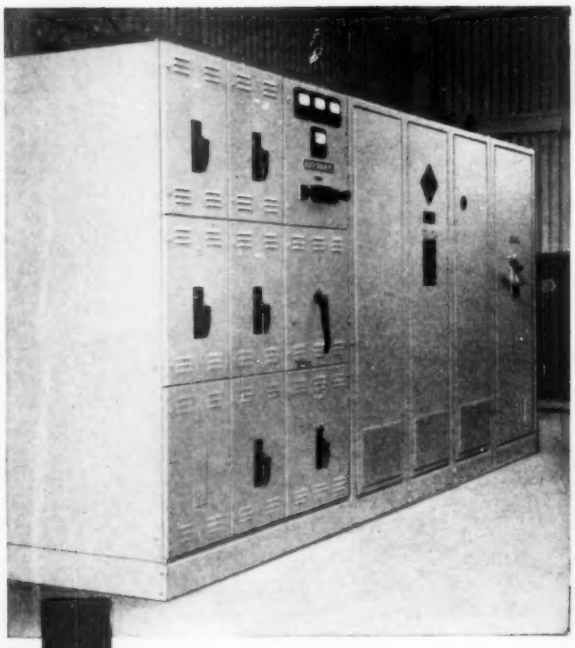
Unusual flexibility in plant power arrangements results when you use Allis-Chalmers dry-type transformers. You get better lighting and increased production. For example, when your plant's lights are supplied by their own dry-type transformers, you can change plant layouts without interfering with the normal full power supply you need for good lighting.

In addition, dry-type transformers give you power for machines where you need it — when you need it. They increase machine efficiency by eliminating line drop from long copper runs. They simplify plant layout changes. For a new machine you just add a dry-type transformer where required. You don't need to interrupt power to all stations by tapping into a common bus.

Your local Allis-Chalmers office or distributor will help you plan the most effective power installation for your plant. Or write Allis-Chalmers, Milwaukee 1, Wisconsin for Bulletin 61B6382A. A-4372

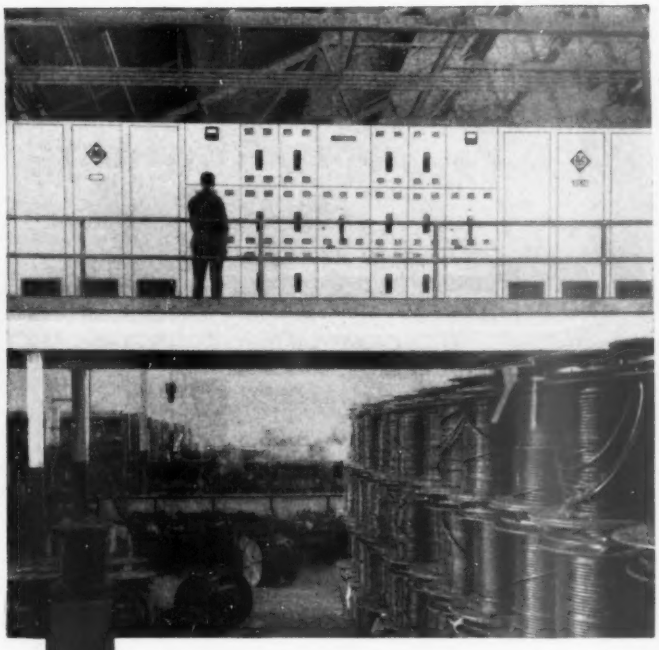
A-C ALLIS-CHALMERS

ALLIS-CHALMERS



ON ROOF

Here's a spot out of the way of production flow — ideal for a unit substation. Lines to machines are short and direct. Either outdoor units or indoor units inside an enclosure can be used.



ON BALCONY

Here's another way to conserve valuable floor area! Substation is out of the way — yet right where it does the most good. While construction of balcony must be sturdy, it need not be expensive.

THERE'S ALWAYS

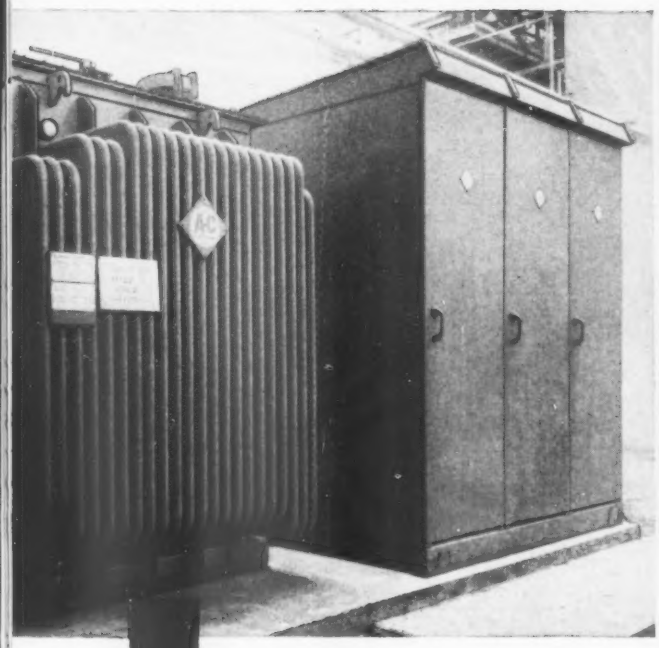
Modernize electrically with Allis-Chalmers switchgear placed in nonproductive space

● Bringing high voltage lines close to load centers is no problem with compact Allis-Chalmers unit substations. They fit anywhere . . . on the roof . . . on a balcony . . . in the basement . . . or outside near the building.

● Allis-Chalmers unit substations simplify the problem of keeping electrical distribution in step with increased power usage; help you get full production out of tools and equipment; and help you improve operating costs.

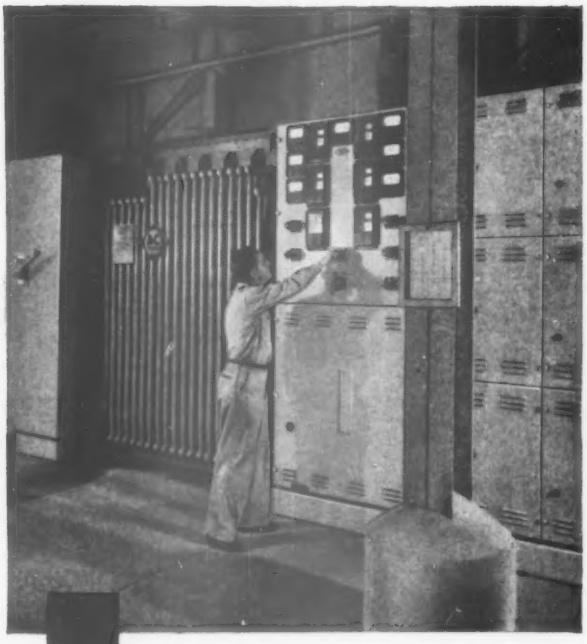
A-C ALLIS-CHALMERS

ALLIS-



AR BUILDING

If indoor atmosphere is hazardous or floor space and overhead space are at a premium, outdoor weatherproof unit substations can be placed near building.



BASEMENT

Where basement-located pumps or compressors are the main load or where machinery is light in weight, substations are often placed under the main floor.

ROOM

AVOID THESE LOSSES BY USING UNIT SUBSTATIONS

Reduced Motor Torque — Torque and horsepower drop when voltage drops. Unit subs improve voltage by shortening low voltage cable runs.

Power Interruptions — Special circuit schemes on standard Allis-Chalmers switchgear permit removal of breakers without power interruption.

Prolonged Down Time — Many old breakers are now inadequate and a fault could cause down time.

High Moving Costs — Packaged unit subs and bus duct cut equipment relocation costs.

Lost Dryer Output—10% undervoltage cuts output of infrared oven 15%.

Lost Overload Capacity — Overload capacity drops about 10% for every 5% below rated voltage.

High Cable Costs — Savings in cable alone can go a long way toward modernizing a distribution system.

A-4246

GET COMPLETE INFORMATION

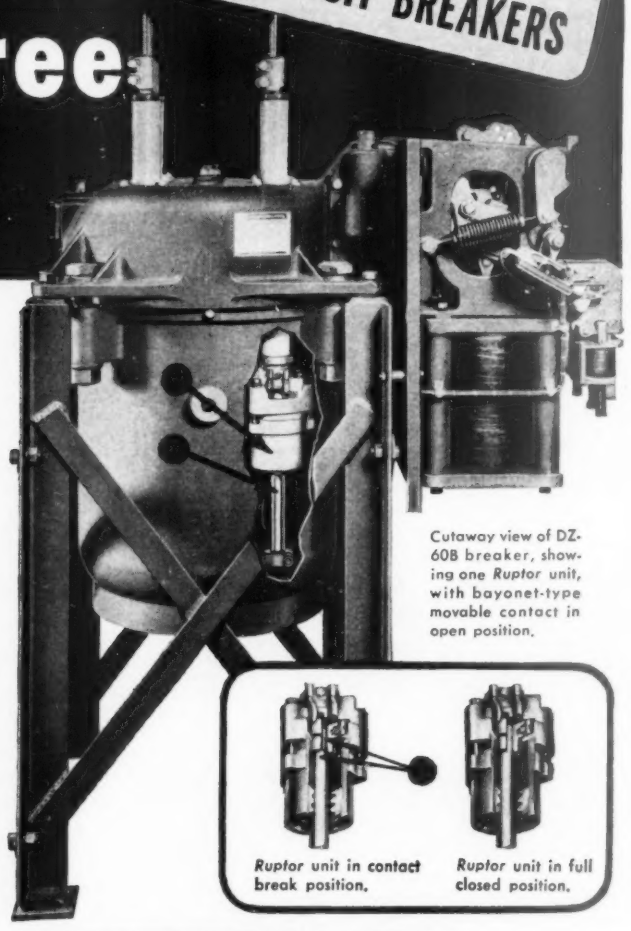
Let experienced Allis-Chalmers switchgear engineers help you solve your distribution problems. Call your nearby A-C district office, or send for new 24-page bulletin "Power at Load Centers Pays Off" (11B6285B). Allis-Chalmers, Milwaukee 1, Wisconsin.

CHALMERS

Three Reasons Why

...Years of Trouble-Free Service

ALLIS-CHALMERS
Indoor
OIL CIRCUIT BREAKERS



Cutaway view of DZ-60B breaker, showing one *Ruptor* unit, with bayonet-type movable contact in open position.

Ruptor unit in contact break position.

Ruptor unit in full closed position.

One **Few moving parts!**

Bayonet contacts (1) are the only moving parts of the *Ruptor* interrupting device.

Two **Easy inspection!**

Drop the tank, and the bayonet contacts are visible in open position. For access to the stationary contacts, one needs only to remove four bolts and cylindrical shell (2).

Three **Self-aligning and Self-cleaning contacts!**

Tulip and bayonet contacts (3) maintain high conductivity without readjustment or cleaning. Arc energy is minimized by efficient interruption within oil-filled *Ruptor* unit. This in turn contributes to long contact life and low oil deterioration.

In addition, a mechanically trip-free solenoid operating mechanism controls contacts of time-proved *Ruptor* interrupting devices. And pole unit mechanism is self-lubricated — completely enclosed — sealed from dust, dirt, corrosion.

In brief, Allis-Chalmers DZ breakers are built to assure years of dependable, trouble-free service.

Allis-Chalmers power circuit breakers are available in ratings from 2.5 to 230 kv, with interrupting capacities from 15,000 to 10,000,000 kva, to meet all industrial and power company requirements. For more information, call your nearby A-C representative, or write to Allis-Chalmers, Milwaukee 1, Wisconsin.

A-4057

Ruptor is an Allis-Chalmers trademark.

TYPE	RATED KV	MINIMUM KV AT RATED KVA	RATED AMPS	KVA INT. CAPACITY
DZ-40B*	7.2	2.3	600	100,000
			1200	100,000
			2000	100,000
DZ-60B†	13.8	4.0	600	150,000
			1200	150,000
DZ-100B†	13.8	4.0	1200	250,000
DZ-200B†	13.8	6.6	1200	500,000
			2000	500,000

*Ask for Bulletin 71B6179. †Ask for Bulletin 71B6129.

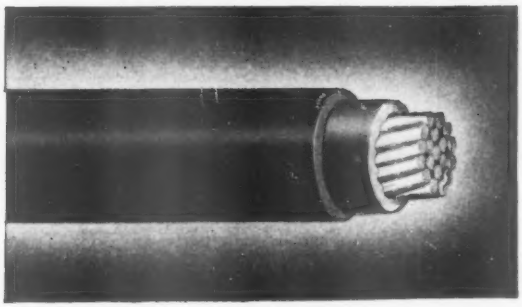
ALLIS-CHALMERS

A-C ALLIS-CHALMERS

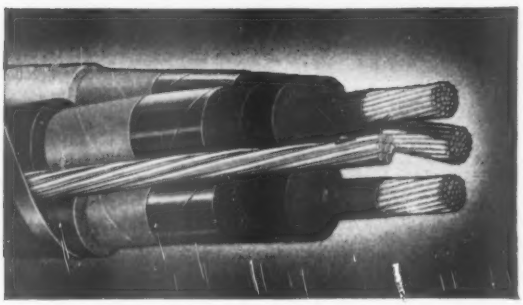
10 reasons why

you should specify, buy,

install U. S. GRIZZLY® POWER CABLES



U. S. Grizzly Power Cable, 600 volts – Type RR single conductor, Hydrosec® – S heat- and moisture-resistant insulation, Neoprene jacket.



U. S. Grizzly Power Cable, 5,000 volts – Type RR – 3-conductor, Uskorona® – ozone-resistant insulation – shielded – Neoprene jacket.

1. Lighter in weight than lead-sheathed cables and lead-sheathed armored cables.
2. Greater flexibility
3. Easier to handle during installation
4. Easier to splice, tap and terminate
5. More resistant to chemical corrosion
6. Unaffected by stray currents
7. Better protection against weathering
8. Longer life
9. Cost less
10. Made by United States Rubber Company, the *only* electrical wire and cable producer to grow its own natural rubber, make its own synthetic rubber and manufacture its own plastics

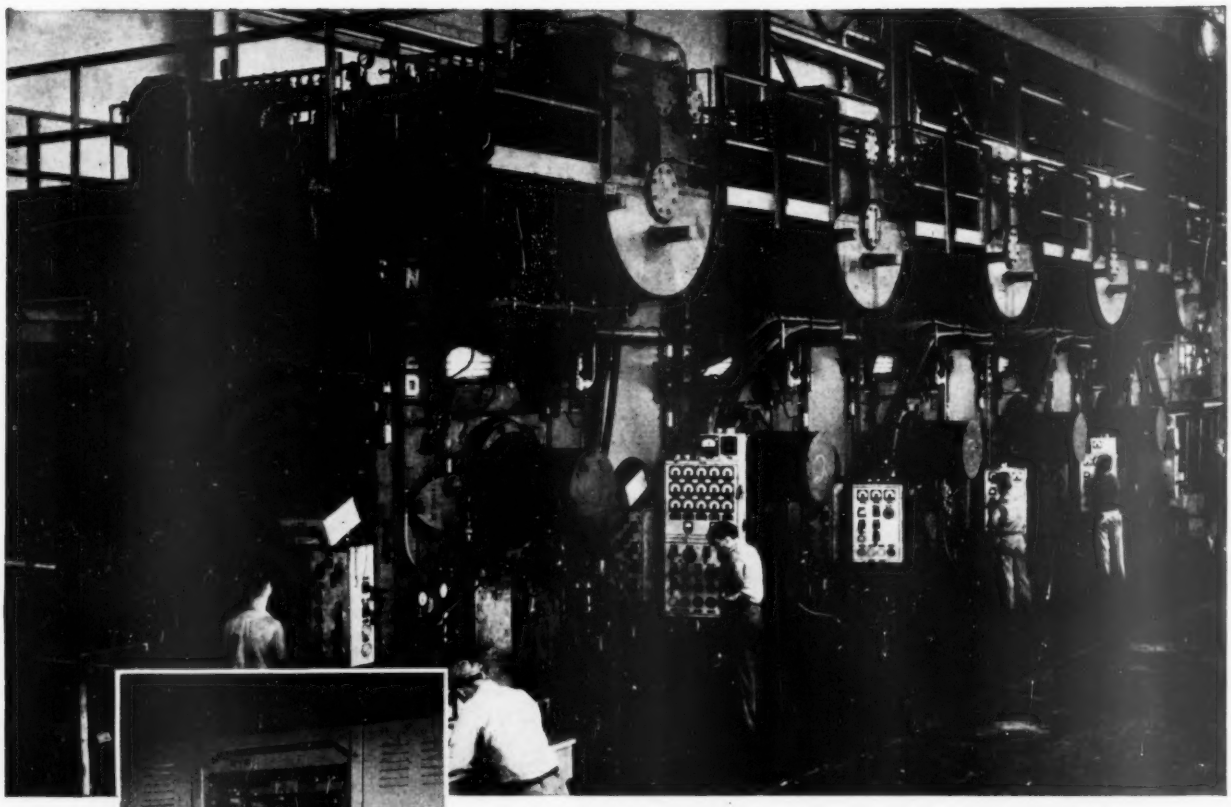
U. S. Grizzly Power Cables are used for general power distribution, and can be installed in conduits, underground ducts, buried directly in the ground, or installed aerially. Neoprene jacket protects against acids, alkalies, oils, and mechanical damage and weathering. (All IPCEA and NEMA specifications complied with.)

Write to address below for free catalog, U. S. Electrical Wires and Cables.

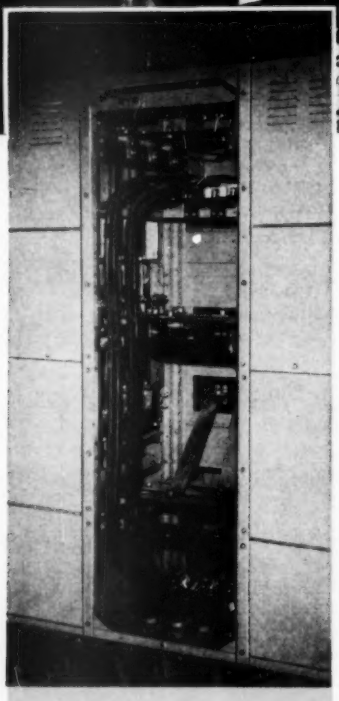
US RUBBER

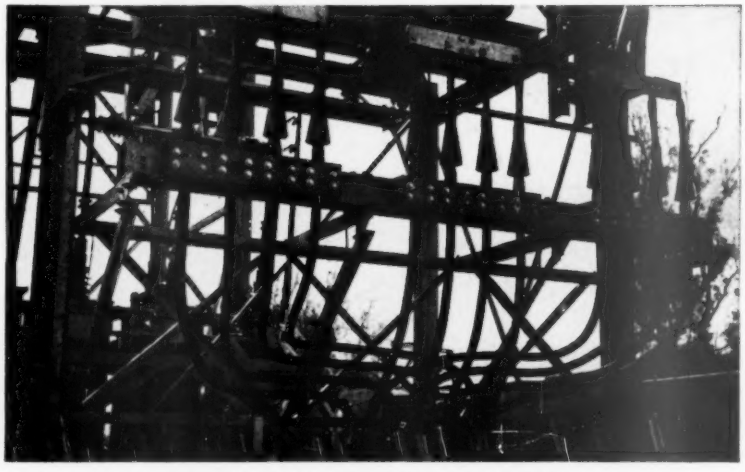
UNITED STATES RUBBER COMPANY

ELECTRICAL WIRE AND CABLE DEPARTMENT, ROCKEFELLER CENTER, NEW YORK 20, N. Y.

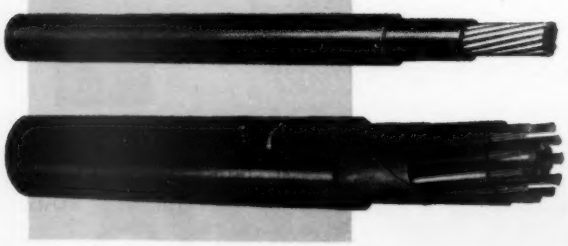


Cable dependability is of utmost importance to this five-stand cold reduction mill. Cable must be able to withstand high-operating temperatures, corrosive fumes from acid pickling line, oils and abrasives.





Outdoor connections at switch yard. Note manually prepared terminals.



The 600 volt cable for motor connections and single conductor control cable was RoMarine-RoPrene, style RR-D. All sizes from No. 12 to 1000 CM style RR-D were used for this service.

Multi-conductor control cable in this installation is RoLene (polyethylene) insulated and RoPrene (polyvinyl chloride) sheathed, described by Rome Cable specification CT-2.

Recently built Kaiser Steel Tin Plate Mill (left foreground), Fontana, California. Capacity is 200,000 tons of tin plate per year.

Electrical Contractor: Kaiser Engineers, Inc.

How Kaiser Steel licked 3 tough cable problems all at once

In selecting power cables for 6.9 KV circuits at its new Fontana Tin Plate Mill, Kaiser Steel Corporation faced three knotty problems:

First, the hazard of acid and alkali corrosion was severe.

Second, the threat of electrolytic action was more than a possibility.

Third, termination and splicing costs were important factors.

Kaiser's choice for this service fell to single conductor, 500,000 CM Rome RoZone-RoPrene shielded power cable, insulated for 9 KV. Two sets were installed to connect the main substation with two 6,900 volt busses in the tin mill proper. Total connected load to the busses was 19,000 HP of M-G motors and 14,250 KVA of transformers.

Why RoZone-RoPrene

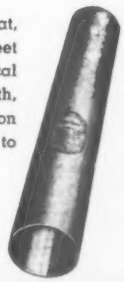
RoZone insulated, RoPrene sheathed cables offer maximum protection against acids, alkalies, oils, greases, moisture, heat, sunlight, and flame. They are non-metallic sheathed and require no lead sheaths with subsequent cathodic protection against electrolysis. Their RoZone (premium quality oil base) insulation provides exceptional resistance to corona action and ozone cutting.

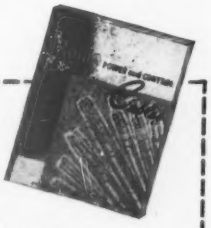
Simple manual terminations eliminate the need for regular wiped potheads. Standard splicing kits only are needed; no costly wiped joints. And the smooth surface of the RoPrene (Neoprene compound) sheath makes for easy working and pulling through conduits and junction boxes.

HELPFUL INFORMATION—Whether your electrical requirements involve special cable designs to meet severe service conditions or simple home wiring, consider the advantages Rome products offer from the standpoint of price and quality. For information that you may find immediately useful, send for the *Rome Power and Control Cable Catalog* illustrated below.

500,000 CM, single conductor shielded, RoZone-RoPrene power cable, rated at 9 KV.

To give wires and cables added protection against heat, moisture, corrosion and abrasion, several thousand feet are encased in Rome • EMT. This is a superior electrical metallic tubing, electrically welded for extra strength, with an electrogalvanized exterior surface for protection against corrosion and a mirror-smooth interior surface to prevent cable injury.





You'll get a wealth of helpful information from the Rome Power and Control Cable Catalog. It contains 65 pages of illustrated information, specification and test data on all Rome power and control cables and on famous Rome insulations. Mail the coupon for your copy today.

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Now!...

An INTERRUPTING RATING in EXCESS of 100,000 AMPERES *for every set of fuse clips in your plant* . . . simply by installing FUSETRON *dual-element* FUSES

The Biggest Electrical Protection NEWS Since BUSS invented the FUSETRON Dual-Element FUSE

FUSETRON is a trademark of the Bussmann Mfg. Co., Division of McGraw Electric Co.

In 1947 tests made by the Electrical Testing Laboratories of New York, showed that on a circuit set to deliver 50,000 amperes, FUSETRON fuses in all tests cleared the circuit safely.

50,000 amp. Interrupting Capacity in 1947
becomes
100,000 amp. Interrupting Capacity Today

After years of intensive development work on FUSETRON fuses new tests were conducted under conditions that simulated the most severe field conditions and these tests were witnessed and verified by the Electrical Testing Laboratories of New York.

On circuits set to deliver in excess of 100,000 amperes, 30 to 600 ampere, 250 and 600 volt FUSETRON dual-element Fuses on each and every test cleared the circuit without belching flame or venting hot gases and with comparatively little noise.

Oscillograms of these tests interpreted by the Electrical Testing Laboratories, showed that the total available amperes including the direct current component, reached values as great as 165,000 peak amperes on 240 volt tests and as high as 212,000 peak amperes on the 535 volt tests.

This indicates that an interrupting rating of 100,000 amperes for FUSETRON dual-element fuses is a conservative one.

No interference with time-lag

In the development work to increase interrupting capacity in FUSETRON fuses it was kept in mind that the time-current characteristic must be maintained. Time-lag is of utmost importance to give proper motor and electrical protection and to eliminate needless blowing of fuses.

Remarkable results have been achieved. Interrupting capacity has been greatly increased while the time-current characteristic of FUSETRON fuses has in no way been disturbed.

Play Safe – install Fusetron Fuses throughout the entire electrical system!

Think!...

ALL THIS ADDED SAFETY *without changing a panelboard or switch... plus* 10 Point Protection of FUSETRON *dual-element* FUSES!

On NEW Construction tell your Architect to Specify this SAFER, BETTER PROTECTION

Maximum Safety

With FUSETRON Fuses there is no cascading of interrupting rating — no places where an excessive fault current might cause serious damage. Every FUSETRON fuse has an interrupting rating in excess of 100,000 amperes.

You don't have to worry about selecting chosen spots in which to *pay extra* for "safe" equipment. Wherever a FUSETRON fuse is installed you have safety as sure and dependable as you can buy — no matter what you pay.

No Maintenance Costs

When FUSETRON fuses have once been installed properly you can forget about them. They need no periodic inspections to see if they will operate safely.

Dust, fumes, corrosion or age cannot prevent a FUSETRON fuse from opening safely. There are no hinges, pivots or contacts to stick or slow down the operation of the fuse on short-circuit.

With FUSETRON fuses — you get safety — without one cent spent for inspection or maintenance costs.

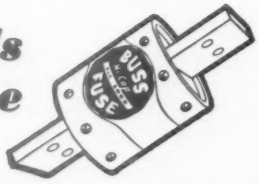
No Recalibration Costs

When a FUSETRON fuse does blow, there is no recalibration needed. As quickly as the fault in the circuit is corrected, you slip in a new fuse that has been CALIBRATED AT THE FACTORY BY ENGINEERS—a fuse that is as safe and dependable as the one that blew.

PLUS 10 POINT Protection with FUSETRON dual-element FUSES

1 Protect against short-circuits. **2** Protect against needless blows caused by harmless overloads. **3** Protect against needless blows caused by excessive heating — lesser resistance results in cooler operation. **4** Provide thermal protection — for panels and switches against damage from heating due to poor contact. **5** Protect motors against burnout from overloading. **6** Protect motors against burnout due to single phasing. **7** Give DOUBLE burnout protection to large motors — without extra cost. **8** Make protection of small motors simple and inexpensive. **9** Protect against waste of space and money — permit use of proper size switches and panels. **10** Protect coils, transformers and solenoids against burnout.

for SAFE PROTECTION on loads above 600 and up to 5000 Ampere install BUSS Hi-Cap FUSES



Tests have shown that BUSS Hi-Cap fuses have unlimited interrupting capacity on circuits of 600 volts or less.

They are designed to give protection against dangerous overloads as well as high fault currents — yet their speed of operation on heavy shorts limits currents to safe values. This minimizes damage to equipment and cuts down dangerous stresses on transformers.

When coordinated properly with FUSETRON dual-element fuses they will not open ahead of the fuses nearest to the fault. Thus trouble is isolated to the part of the circuit in which the fault occurs.

Added SAFETY on Old Installations

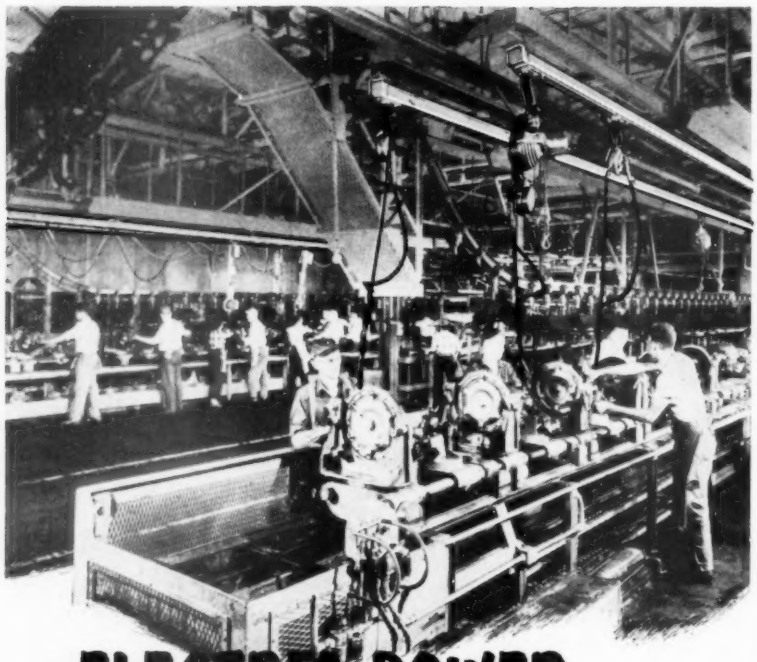
On installations where the increase in the capacity of the circuit has outgrown the interrupting rating of the circuit breakers, BUSS Hi-Cap fuses offer a safe and relatively inexpensive way to protect inadequate breakers against rupture in event of a bad fault.

ACTION THAT SAVES YOU MONEY

By passing the word along that all purchase and stock records should call for FUSETRON fuses on loads up to 600 amps—and BUSS Hi-Cap fuses on loads above that — you get action that begets money saving.

For blowing time charts or more information on FUSETRON Fuses and BUSS Hi-Cap Fuses write for Bulletins FIS and HCS.

Bussmann Mfg. Co., University at Jefferson, St. Louis 7, Mo. Division McGraw Electric Company



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where you want it...when you need it!

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● Get acquainted with industry's most modern, most flexible, most convenient system of electrical distribution — FEEDRAIL Trolley Busways. Here's the electrification system that's made to order for fast, low-cost assembly and production.

Installed over work areas, FEEDRAIL provides a continuous, uninterrupted source of electric power. Through its easy rolling trolley outlets, the power can be brought to the work — or move right along with it. Any tool or machine used on an assembly line can be powered by FEEDRAIL. If new tools are put into service, additional trolley outlets can be quickly and easily inserted in the track without shutting down power — and without interrupting work in process.

And, should future plans require extensive changes in your production set-up, FEEDRAIL can be quickly dismantled and reinstalled in another area to serve an entirely different operation.

GET THE FULL CONVINCING DETAILS...
Descriptive literature showing how FEEDRAIL can be applied to your own requirements is yours for the asking. Write Dept. O-6.

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ELECTRICAL DISTRIBUTION

OTHER SECTIONS:
Production ..... *Page 176*
Buildings & Grounds *B-28*
Plant Services *D-29*

80 · Control Centers. This 24-pager tells about the advantages of centralized electrical control systems, using maker's a-c motor control centers. Specs and dimensions, other planning data. Booklet PL-6200. *Clark Controller Co.*

81 · Electrical Distribution. This 30-page catalog (TDA-1) gives specifications for distribution equipment. Panelboards, switchboards, control centers, prefabricated distribution systems, and miscellaneous equipment. *General Electric Co.*

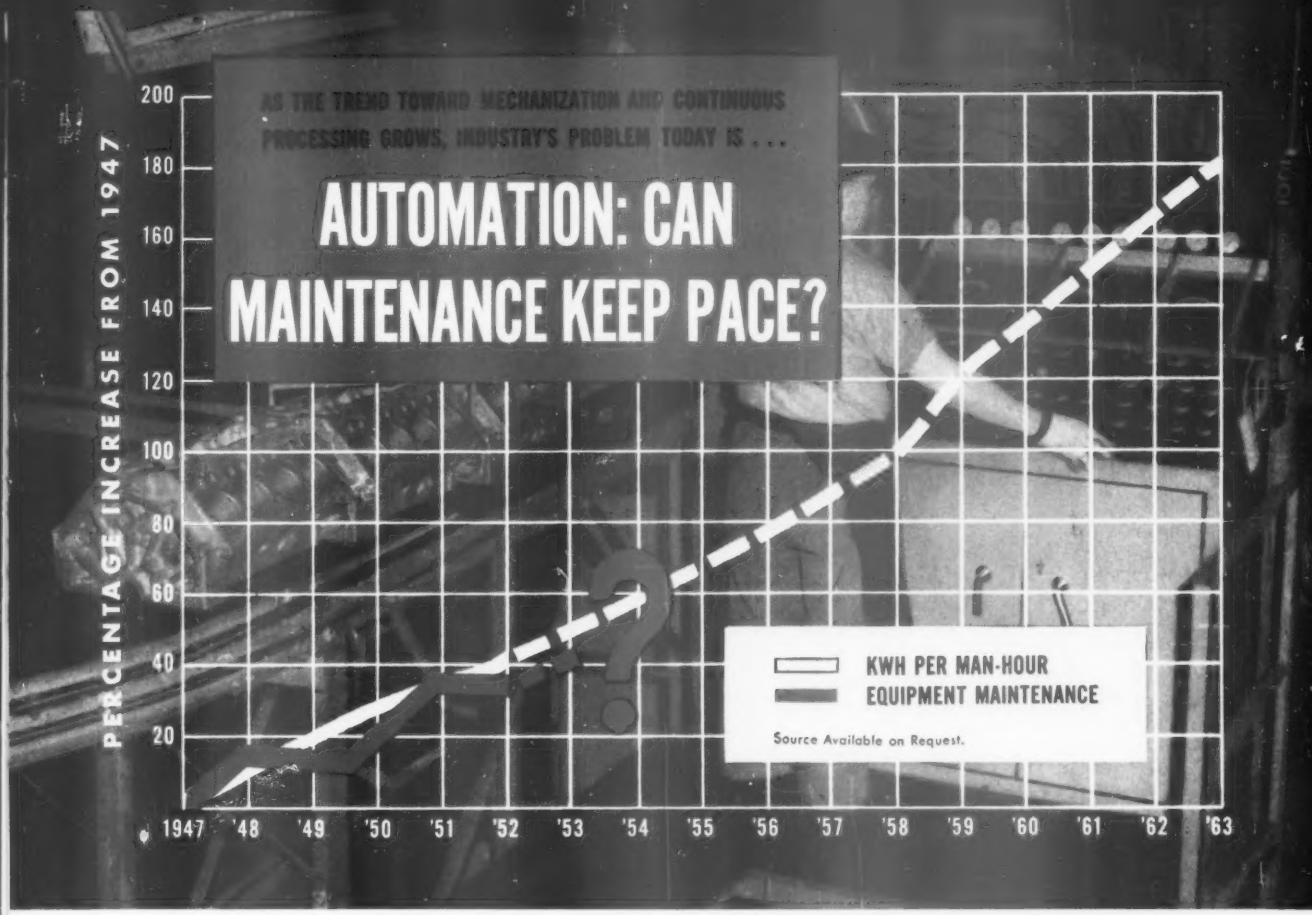
82 · Packaged Distribution. Two catalogs (86 pages) of useful application and performance data on plug-in and trolley-type systems. Construction details and helpful "how-to-do-it" information. *General Electric Co.*

83 · Electrical Equipment. A group of useful booklets (over 100 pages) that feature all kinds of distribution equipment. Everything from panelboards and bus duct to enclosed switches and floor outlets. In indexed reference folder. *Frank Adam Electric Co.*

84 · Unit Substations. Bulletin No. 11B6285B (24 pages) tells you how to choose a load center unit substation to meet specific power requirements. Illustrations show available models in a variety of locations. *Allis-Chalmers Mfg. Co.*

85 · Voltage Regulators. Here's a 12-page booklet of specifications and performance characteristics

➤ To get these catalogs, circle item numbers on the Reader Service card next to back cover.



One answer is General Electric's 5-step *Productive Maintenance* plan

- **More is expected from maintenance as industry continues its drive to reduce product costs**
- **And as kilowatt-hours per man-hour hit new peaks, trends toward automation are forcing a closer look at maintenance procedures**
- **But 9 out of 10 electrical maintenance programs are obsolete in one area or another**
- **To help maintenance keep pace, General Electric offers a 5-step *Productive* Maintenance plan**

In every industry, operations are constantly being made more efficient to increase output, quality, and reduce product cost. Plant electrification is expanding . . . more continuous processing lines are being set up . . . the first steps toward automation are being taken.

To help reduce product cost, similar planning and new techniques must be applied to maintenance. For this reason, General Electric has worked out a step-by-step plan called "Productive Maintenance." With it, you can organize an electrical maintenance program that will measure up to the constant drive for more production at lower cost.

Notice that G.E.'s plan is called *Productive maintenance*, and not preventive maintenance. There's a big difference. Maintenance must go beyond any negative concept . . . to where it is fully as important as production itself.

SEE THE NEXT 7 PAGES for the five basic steps in every *Productive* Maintenance Plan, specially designed to help you deliver more production for every maintenance dollar.

GENERAL ELECTRIC

TURN PAGE FOR 5-STEP PLAN

G.E.'s *Productive Maintenance* Plan

STEP 1 Gather complete equipment data

Start your *Productive Maintenance* plan by making a complete equipment inventory. The resulting record system will be a basic part of your entire new maintenance program

As your first step, determine *what* electrical equipment you have in your plant and *where* it is. An inventory number should be assigned. Usually, a system that indicates building, floor, and machine number is used conveniently for this purpose.

HERE'S WHAT YOU MUST KNOW. A well-edited record sheet or card should include a description of the equipment, application, rating, serial number, manufacturer, purchase order number, inventory number, and cost information.

TO BE EFFECTIVE, a Productive Maintenance Plan begins with a complete inventory of all plant equipment.

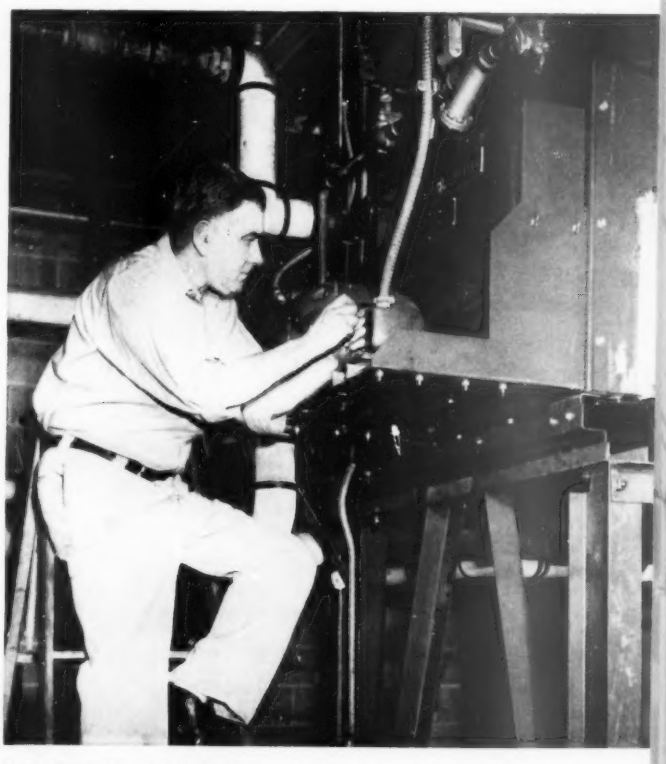
G.E.'s *Productive Maintenance* Plan

STEP 2 Determine extent of routine maintenance

Determine the amount of maintenance necessary for your electrical system. Some equipment will be excluded from the plan

Select equipment on which maintenance effort is to be expended in your program. Include only those items where *Productive* Maintenance will pay, or help make workers safe.

Anybody can do a complete routine maintenance job—but it may be unnecessarily expensive. In some cases, it will be cheaper to replace or repair a part or the entire piece of equipment after it breaks down, rather than use high-cost manpower to inspect and maintain it. Equipment that is not considered important enough to be brought into the *Productive* Maintenance plan can be repaired in answer to non-scheduled requisitions by production supervisors.



NON-CRITICAL EQUIPMENT, such as the motor for this air-conditioning unit, may not warrant being included in the plan.

G.E.'s *Productive Maintenance* Plan

STEP 3 Establish a routine operating control system

Put the equipment data you gathered in Step 1 to work. Use it to set up inspection schedules, work orders, renewal parts stocking system and to record costs

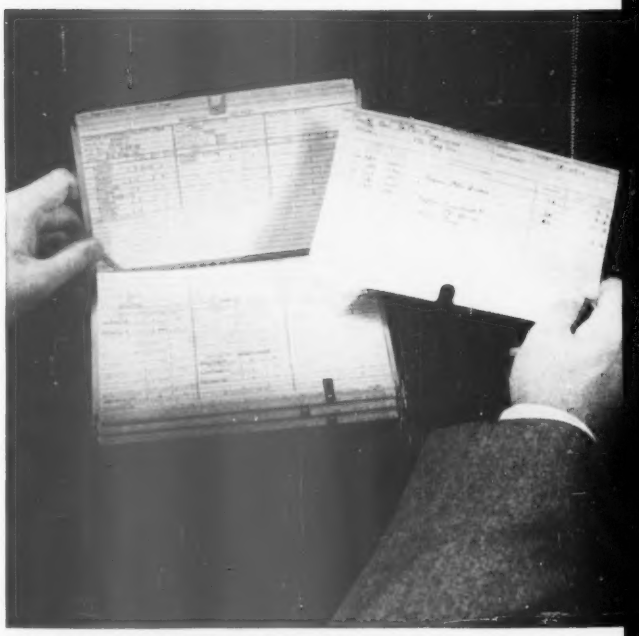
WORK OUT YOUR INSPECTION CYCLE. Consider the duty and application of all equipment. Then strike an inspection balance between "too often," with resultant waste of money, and "not often enough," with the possible damaging equipment outages that occur. The repair record will tell if more attention is needed. Ask your maintenance men to note on their check lists or report forms whether the frequency of inspection can be increased or decreased.

DEVELOP A WORK ORDER PROGRAM for routine maintenance work. Although there is no such thing as a universal work order (each plant must develop its own) certain essential information should be included on each. The work order ought to include a job number, job location, department number for charging purposes, the craftsmen required, the date required for completion, a description of the work to be done, an estimated and actual cost for labor and materials, and approval spaces.

GET RENEWAL PARTS RECOMMENDATIONS. Have your electric equipment manufacturer study the equipment recorded in your file. He will recommend the type and quantity of renewal parts you should stock. List these parts on the record card so the responsible maintenance man can determine immediately what parts are authorized for stock, and can identify these parts by number.

SET UP AN INVENTORY CONTROL SYSTEM. Estimate the approximate turnover rate for each part, procurement time, and the cost of acquisition to determine the minimum stock level to act as a reorder signal. To prevent duplication of identical parts sold under different numbers by different suppliers, cross-reference the parts numbers, and maintain the stock under only one number.

PURCHASE PARTS FROM ORIGINAL SUPPLIER—it's the best practice. The original supplier will have a greater interest and responsibility in the equipment operation. Parts will be the same dimensions, will have the same or better quality, and will be constructed to take advantage of recent engineering advances.

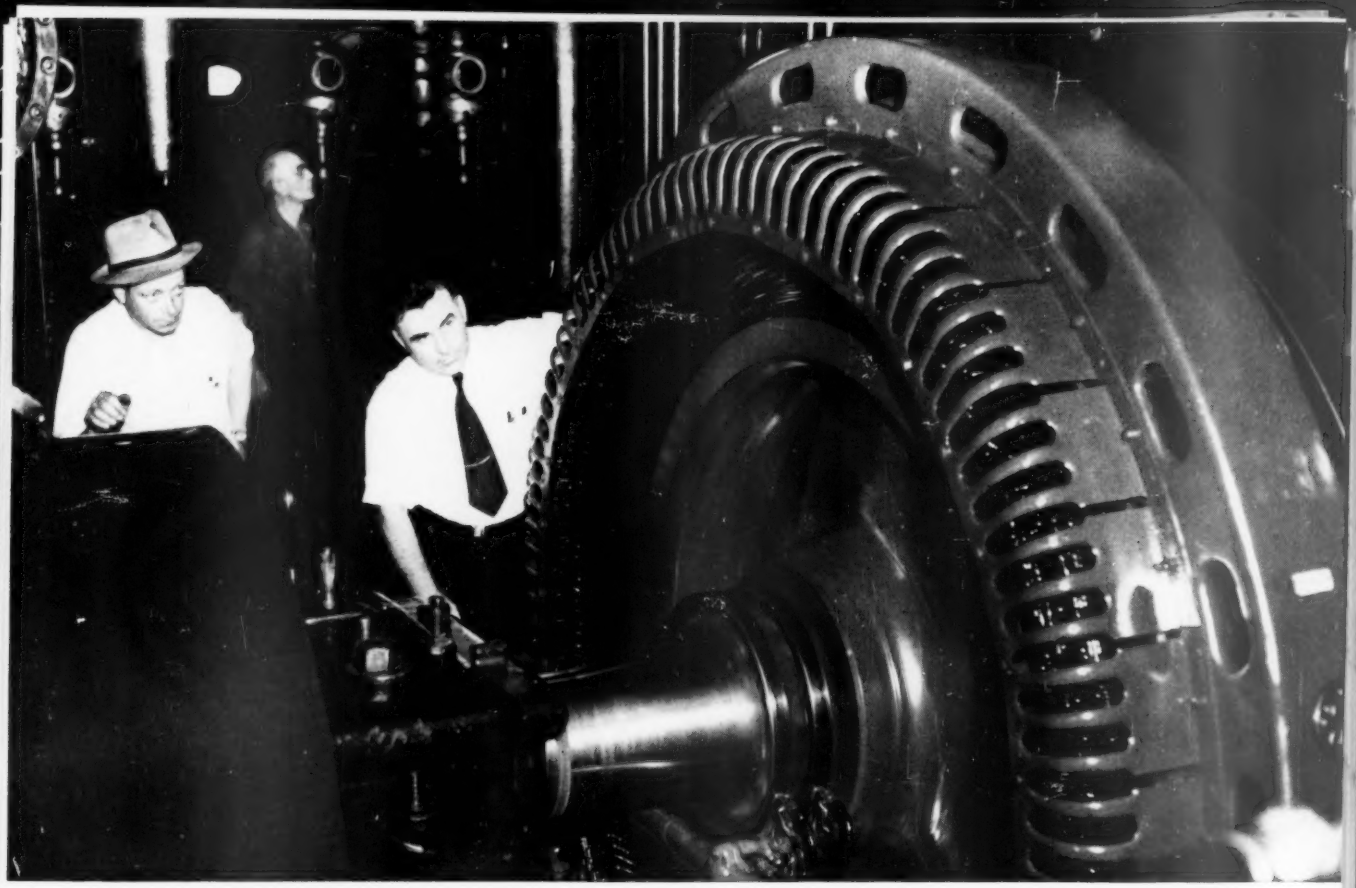


THE HEART OF ROUTINE MAINTENANCE is the keeping of proper, up-to-date records and paper work.

THE RECORD OF LOST TIME will tell you if inspection is balanced between "too often" and "not often enough."

GENERAL ELECTRIC

TURN PAGE FOR STEP 4



YOUR EQUIPMENT SUPPLIER will help you determine the condition of units on your critical list.

G.E.'s *Productive Maintenance* Plan

STEP 4 Evaluate for critical maintenance

List all equipment vital to production and inspect it thoroughly. Then, determine the critical-parts protection you need for each key machine

Close co-operation between Production and Maintenance Departments is necessary to determine what electrical equipment is vital to production. Together, these two groups must evaluate the functional importance and duty cycle of all electrical equipment included in your *Productive* Maintenance program.

WHEN IS EQUIPMENT CRITICAL? When its failure directly or indirectly interrupts or delays production. This is appraised by such things as high percentage of utilization, or lack of bypass equipment. Set up this list of equipment in order of importance.

INSPECT ALL EQUIPMENT on this critical list. Your equipment supplier, who has wide experience with his equipment under every type of operating condition, can help you determine the condition of critical units. Consider such things as age, duty-cycle, surges, and overloading. Based on this inspection, make a list of equipment on which the probability of breakdown is high. You will need this information to set up a planned overhaul schedule as discussed in Step 5.

HOW MUCH PROTECTION do you need for each key piece of equipment? The following steps will help you arrive at an answer to this question:

1. Calculate repair time under the following conditions assuming major failure:
   a. No critical parts stocked
   b. Some critical parts stocked (such as coils)
   c. All critical parts stocked (such as complete armature)
   d. Complete unit stocked
2. Determine cost of repair and inventory for each of the possible conditions.
3. Total this information to determine the total "failure cost."
4. Analyze total cost for each condition to determine what you must stock to protect the equipment.

The sample analysis chart at right shows you the factors involved in determining the best degree of protection at the lowest cost for each piece of critical equipment on your list.

Here is an example of how a *Productive Maintenance* analysis determined the best over-all protection for one specific motor doing one specific job:

EVALUATION OF CRITICAL PARTS PROTECTION REQUIREMENTS

(The evaluation is based on the failure of a part which requires the longest repair time, such as armature coils)

	NO CRITICAL PARTS STOCKED	ARMATURE COILS STOCKED	COMPLETE ARMATURE STOCKED	COMPLETE MOTOR STOCKED
REPAIR TIME	10 days to make coils X	6 days to rewind armature X	7 hours to install new armature	3 hours to replace motor
TOTAL DOWNTIME COST	$168,000	$100,800	$4,900	$2,100
COST OF PARTS PROTECTION	0	Coils: $4,664	Armature: $25,600	Motor: $46,000
COST OF REPAIR	$12,730	$5,900	Installation: $850	Installation: $360
TOTAL FAILURE COST	$180,730	$111,364	$31,350*	$48,460*

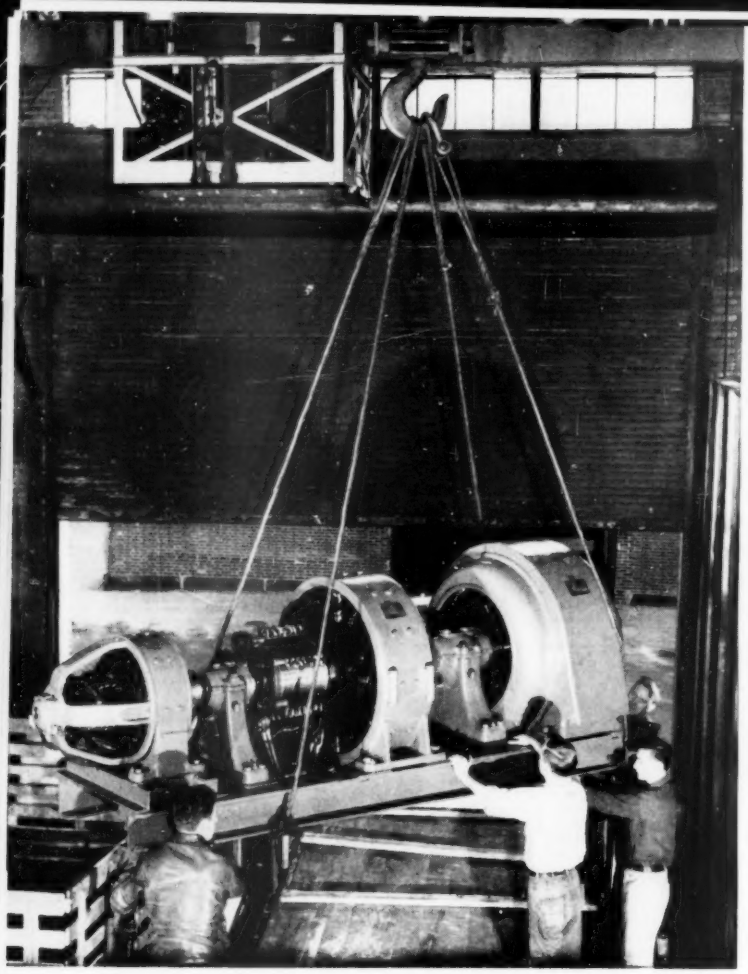
X Add disassembly, assembly and transportation time to actual repair time.

* Add repair cost, on straight time basis, of failed unit. This will be stocked for protection against future breakdown.

IN THIS PARTICULAR CASE HISTORY, the motor involved was a 500-hp slow-speed d-c motor on a machine critical to production at a large western paper mill. The problem was to determine how much an armature failure would cost. Downtime was estimated at $700 per hour. A G-E Maintenance Specialist helped the customer decide to stock a complete armature for best protection.

GENERAL ELECTRIC

TURN PAGE FOR STEP 5



PLANNED OVERHAUL, scheduled in advance, cuts outage time, reduces repair costs.

A CRITICAL MACHINE, like this motor-generator set, should have a rigid time schedule for servicing.

G.E.'s *Productive Maintenance* Plan

STEP 5 Establish a critical maintenance program

Minimize downtime costs two ways: by stocking critical parts, and by scheduling overhaul well ahead.

In Step 4, you determined the right degree of protection for each piece of critical equipment. Now take the action step—set up your critical maintenance program.

WHICH PARTS ARE MOST IMPORTANT? Get them *first*. Then organize your budget so that you can purchase the rest of your critical stock on a planned basis. Remember, too, that your critical equipment demands a more rigid schedule of inspection and service. Maintenance schedules must be more complete, and you must keep closer records of all operations, failures, maintenance and operating costs.

SCHEDULE PLANNED OVERHAUL of equipment inspected and listed in Step 4 on which probability of breakdown is high. Consider the difference in cost between planned overhaul and outage. Planned overhaul is effective after equipment has operated over a reasonable service life. You use it to remove from operation, on a systematic basis, the equipment that needs overhaul. You make this equipment available for inspection and complete rewinding, rebuilding, or modernizing at times most favorable to production. Result: the gap between actual and theoretical maximum production on the part of a machine is narrowed.

SCHEDULE PLANNED OVERHAUL WELL AHEAD, so all the necessary men, tools, and material for the work can be made available at the proper time both in your plant and in the repair shop. Overhaul can be set for normal downtime, vacation closing, holiday shutdowns, or for off-season production periods. Your objective should be to disturb production as little as possible.

PROBABLE RETIREMENT OR REPLACEMENT of every piece of critical equipment should be considered in this step. This means production requirements must be

ORGANIZE YOUR BUDGET to purchase the most important critical parts first.

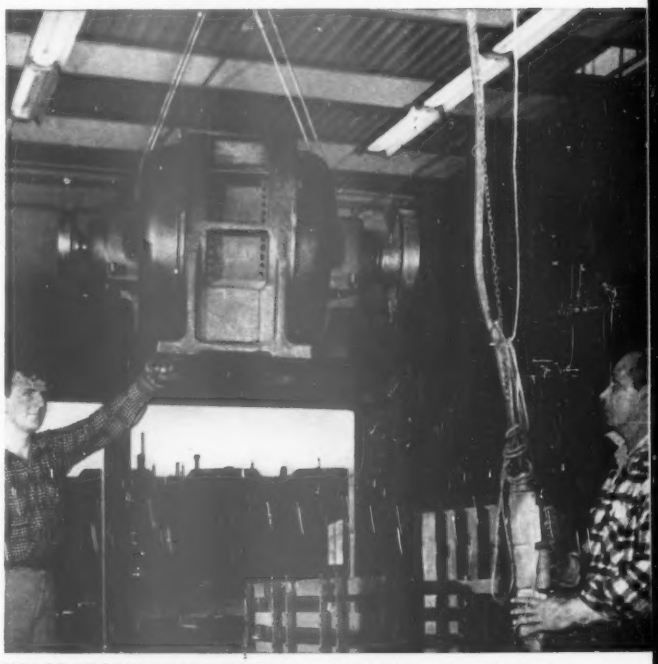
projected into future years. If the anticipated usage of the equipment is only for a short period, it may be economical to assume the risk of operating over that period without planned overhaul, and depend entirely on inspection and routine maintenance.

HOW ABOUT AN OVERHAUL "PACKAGE"? There will be cases where you can schedule overhaul of dependent or secondary equipment at the same time as your major apparatus. In other words, for minimum downtime, overhaul should not be thought of by *machine,* but rather by *manufacturing operation.*

Setting up a Productive Maintenance program is a big job. None of the steps is simple. But by carrying them out, you will show a steady increase in the efficiency of your maintenance program. You will be able to prove that Productive Maintenance is one of the most important and productive functions in your plant's operation.

GENERAL ELECTRIC WILL HELP YOU SET UP YOUR PROGRAM

GENERAL ELECTRIC



THE PROBABLE RETIREMENT of a critical piece of equipment must be considered when setting up overhaul schedules.

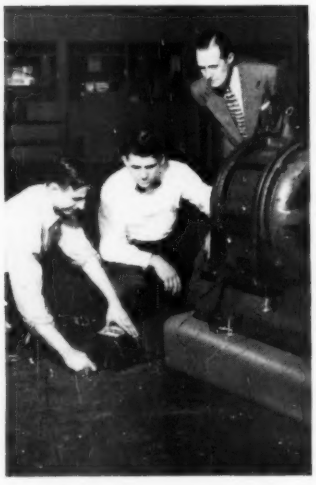
HERE'S HOW G.E. CAN HELP

How G.E. can help you set-up your *Productive Maintenance* Program

Your G-E Apparatus Service Shop representative is a Maintenance Specialist. He will work with you to simplify the job of setting up a *Productive* Maintenance Program in your plant. Call him in for help in the five areas listed below.

YOUR G-E MAINTENANCE SPECIALIST will supply complete parts data . . .

. . . guide you in planning routine inspection, routine maintenance and parts inventories . . .



. . . help you determine condition of all critical equipment and help schedule planned overhaul . . .

. . . help analyze critical equipment for best protection of each machine.

1—SUPPLYING COMPLETE PARTS DATA. Ask your G-E Maintenance Specialist to supply you with the identification of the various renewal parts in each piece of electrical equipment. Your basic records won't be complete without this information.

2—PLANNING ROUTINE INSPECTION AND MAINTENANCE. He can help you organize inspection trips and routine maintenance work by looking over your system, estimating how often equipment will need attention, and offering guidance on the best means of upkeep.

3—ESTABLISHING ROUTINE RENEWAL PARTS INVENTORY. Your G-E Maintenance Specialist can tailor a renewal parts program for your plant and guide you in establishing your parts inventory system.

4—ANALYZING CRITICAL EQUIPMENT FOR BEST PROTECTION. Ask your G-E Specialist to tell you just how long critical equipment repairs will take and how much each job will cost. He'll be glad to help you determine the best protection for each piece of vital equipment.

5—DETERMINING CONDITION OF CRITICAL EQUIPMENT. Your G-E Maintenance Specialist can help you assess the condition of all critical electrical equipment. And he can schedule men and machines at the G-E Service Shop to help you during planned overhauls.

FOR DETAILED INFORMATION:

General Electric Company
Apparatus Sales Division, Section 8801-14
Schenectady 5, New York

☐ Please send me the detailed manual (GEA-6087) on setting up a Productive Maintenance Program in my plant.

☐ Please have a Maintenance Specialist from my nearest G-E Service Shop call on me.

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GENERAL ELECTRIC

of automatic voltage regulators. Features and advantages. Photos of applications. Bulletin S-351. *The Superior Electric Co.*

86 · Voltage Stabilizers. Here's 16 pages of performance characteristics and application data of automatic voltage stabilizers. Where-to-use information and specifications are included in this catalog. *General Electric Co.*

87 · Busway System. In this 8-page catalog (No. TEC-21), you'll find advantages listed for maker's aluminum busbar system. Describes features, gives performance data, suggests applications. Section on available sizes. *General Electric Co.*

88 · Fiber Ducts. A 48-pager that shows you how you can use these under-floor distribution systems. General data and photographs along with specifications for ducts, fittings, junction boxes, and closures. Installation notes and photos show you how. *General Electric Co.*

89 · Q-Floor Wiring. All the information you need to utilize the cells of Robertson Q-Floors as raceways for electric conductors. A 66-page data manual (A.I.A. FILE NO. 31-C-62) describes complete systems, ducts, and accessories. *General Electric Co.*

90 · Control Centers. Complete size, rating, and ordering data in this 12-pager. Specs and features for maker's line of control centers, construction details, and dimensions. Bulletin No. 170. *Arrow-Hart & Hegeman Electric Co.*

91 · Distribution Equipment. In this 122-page catalog No. 109, you'll find most of the company's circuit breakers, switches, panel boards, bus duct, and service

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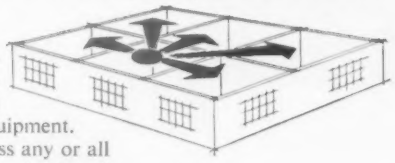
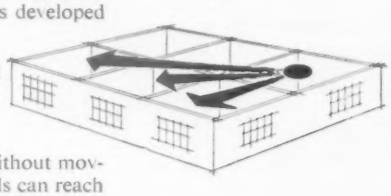
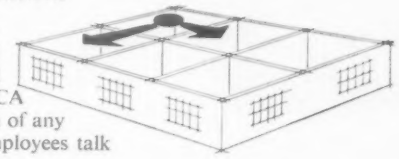


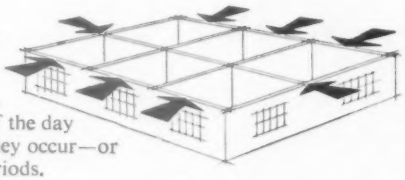
Administration—Push-button administration is still a long way off, but step-saving, time-saving administration can be yours now with new RCA Sound equipment. At the push of a button, you can address any or all of your staff. RCA Unitized Design was developed to answer administrative problems.



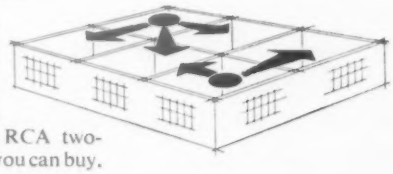
Operational instructions—Co-ordinated instructions—multi-department groups—plant-wide gatherings—emergency instructions—can be set up in seconds with flexible RCA Sound equipment—without moving a man from his job. Department heads can reach every man—with simple push-button selectors.



Employee activities—Employee programs, entertainment—activities of all types—can be handled without a general meeting—without shifting personnel. RCA Sound equipment permits easy selection of any group—can even be arranged to let employees talk back through system.



Outside influences—Radio programs, recorded music, tape recordings of important events—all can be distributed to personnel with your RCA Sound system. The important events of the day can be supplied to your personnel as they occur—or via recording—during lunch or rest periods.



Two-Channel System—With RCA's two-channel sound system, you can set up two simultaneous programs—or a program and a rehearsal—to function independently, to reach different groups. No conflicts in programming, with an RCA two-channel system—the most flexible system you can buy.

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93 · Electrical Distribution. Twelve ideas that can help you cut costs of power distribution. GEA-5900 is a 28-page booklet of diagrams, photos and suggestions. You'll find all you need to know to improve your power distribution. *General Electric Co.*

94 · Control Centers. A 12-page bulletin describes control centers. Gives design features and advantages; tells how additional control elements may be added to meet changing requirements. Catalog No. 170. *Arrow-Hart & Hegeman Electric Co.*

95 · Emergency Power Control. "When normal power fails" is title of this 38-page catalog (No. 528). Features applications and engineering data. Dimensions, weights, and tables. Section on engine generator starting units. *Automatic Switch Co.*

96 · Coated Tubing. A couple of descriptive folders on plastic coated electrical metallic tubing. Specifications and photos showing how to connect conduit without special tools. Electrical and mechanical properties. *Republic Steel Corp.*

97 · Conduit. A 12-pager that shows design features and test data on threaded and unthreaded

Turn to page C-42

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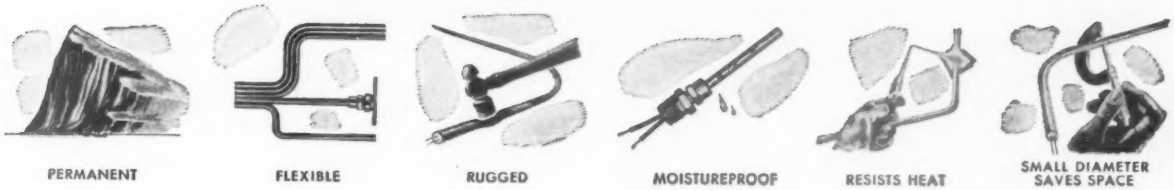

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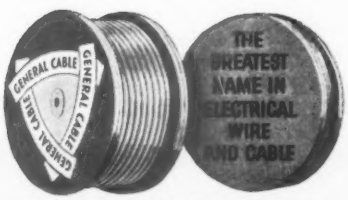

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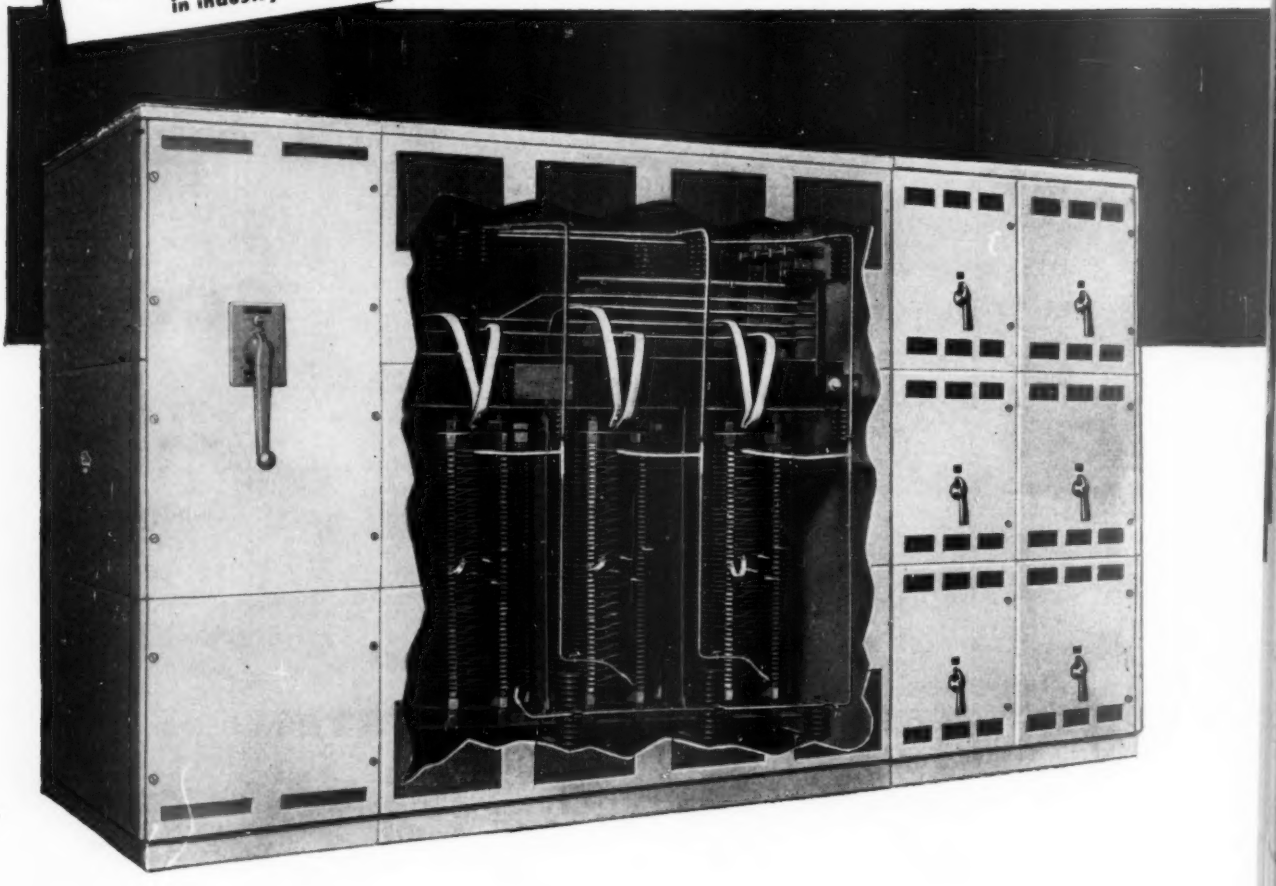

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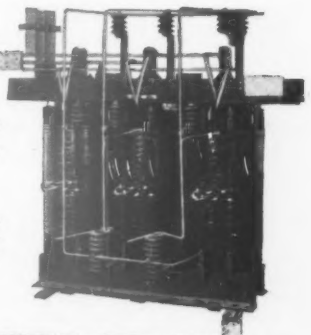
Investigate the many advantages of specifying Wagner "Predesigned" Dry Type Unit Substation Transformers for your next load-center installation. Consult the nearest of our 32 branch offices, or write direct to us.



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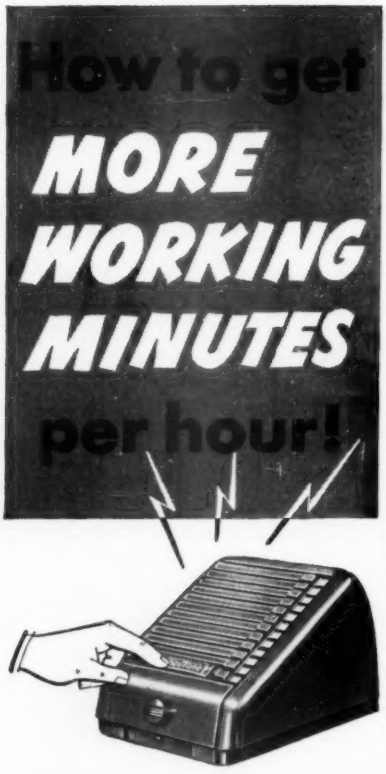

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galvanized conduit. Includes accessories, and comparison data with other types of conduit. Tells where to use. *National Electrical Products Corp.*

98 · Fiber Conduit. A 16-page booklet tells about installation of fibre conduit with or without concrete encasement. This catalog No. 51 gives schematic diagrams and photographs as well as dimensions. *Orangeburg Mfg. Co.*

99 · Plug-in Cables. Quick lines for lighting or portable tools. These two catalogs (20 pages) show you how. Many plug-and-socket arrangements are illustrated and described. Advantages and pictures of actual installations; specifications. *Joy Mfg. Co.*

100 · Cables. A 64-pager that gives complete specifications to line of single and multiple-conductor cables. Includes cables rated to 15,000 volts. Catalog No. 24 (revised). Gives specifications, pictures, and other useful information to help you pick the right kind for your application. *Rome Cable Corp.*

101 · Magnet Wire. 4-page folder gives sizes and features of coded magnet wire. Describes advantages of film insulation. Specs, selection information, and how-to use-it data. *John A. Roebling's Sons Co.*

102 · Cable. How to select the correct cable is outlined in a 28-page bulletin (OK-105B). Useful installation information and advantages of various single- and multiple-conductor cable are included. *Okonite Co.*

103 · Cables. These two 18-page booklets give specifications of single- and multiple-conductor cables. One covers uses for armored cables. The other gives data on standard and special multiple-insulated and shielded cables. *General Electric Co.*

104 · Cartridge Fuses. This 10-page selection catalog shows cutaway views of various cartridge fuses. Design, information, and time-current curves to help you select the correct fuse for any plant requirements. *Economy Fuse & Mfg. Co.*

105 · Dry Transformers. In this 6-page booklet (plus data sheets), you'll find actual installation photos and information on dry-type transformers. Data sheets give all the electrical specifications needed. Catalog GED-2024. *General Electric Co.*

106 · Small Transformers. Control and signal transformers are described in a 12-page booklet (GEA-1358F). Application, suggestions, features, and advantages are included — with engineering selection information. *General Electric Co.*

107 · Cords and Cables. This 56-page booklet contains a complete description of the company's line of flexible cords and portable cables. Dimensions, cut-away views and ratings. Engineering data also included. *Hazard Insulated Wire Works.*

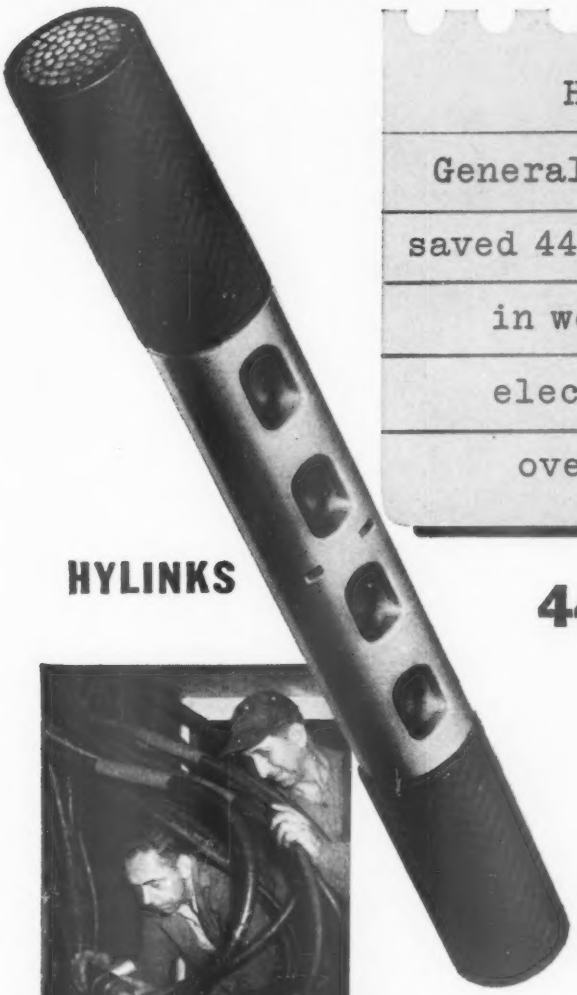
108 · Cord Reels. A 4-pager and 4 data sheets tell about windup reels that make extension cords last longer. Specifications of hard and automatic models. Collector-rings for conducting current to rotating equipment. *Industrial Electrical Works.*

109 · Fuses. In this 24-page catalog, you'll find features and technical data on all types of fuses. Shows how a fuse operates, gives maintenance hints, and brings you excerpts from the National Electrical Code. *General Electric Co.*

Turn to page C-46

To get these catalogs, circle item numbers on the Reader Service card next to back cover.

How
General Aniline
saved 44 man-hours
in weekend
electrical
overhaul



HYLINKS

44 man-hours saved!

Annual factory shut-down for electrical overhaul and maintenance is a growing trend because it permits major work to be done more quickly, safely, cheaply, with minimum interruption of production.

During the last such overhaul at the General Aniline Works in Graselli, N. J., one of the *big* discoveries was the time saved by using Burndy Hydent connectors on their large power feeders: "More than 44 man-hours were saved on installations. The smooth surface of the connector permitted faster taping of the connection, since there were no protruding nuts or bolts to be covered. These connectors permitted the use of smaller junction boxes."

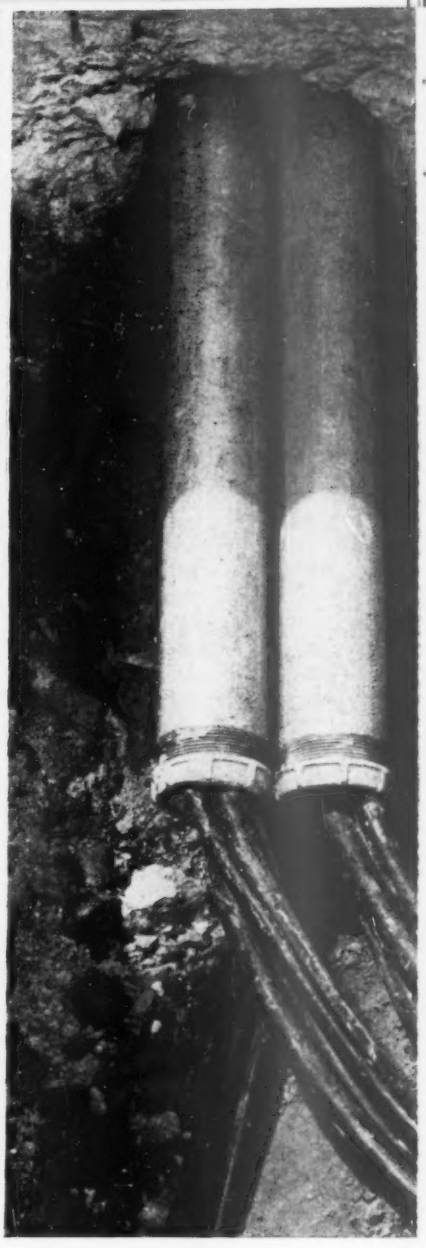
HYPRESS

Whether you're maintaining or modernizing an existing plant electrical system . . . or installing a brand new system . . . remember that Burndy connectors and installation tools – in every size, type and service – help electrical engineers and crews do an *important* job *better!*

Write for complete literature or technical counsel to

BURNDY

NORWALK, CONNECT. FACTORIES: NEW YORK, CALIFORNIA, TORONTO EXPORT: PHILIPS EXPORT COMPANY TORONTO, CANADA



. . . FOR PLANTS

How to get premium wiring for little more

The cable to use is DURASHEATH.
Its actual over-all cost is so little more than the cheapest cable

Wait! Before you buy cable on price alone, see how *little* a premium wiring job actually costs. And what good insurance it is!

When you're wiring up, for power or lighting, the price of wire and cable is but a *fraction* of the over-all cost. Simple arithmetic follows — *it makes very little difference in the total cost of the job* whether you buy

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than you now pay

the cheapest cable or a premium cable like neoprene-jacketed Durasheath*.

But what a difference there can be in performance!

Anaconda's Durasheath is tough . . . heat-resistant . . . long-lasting. Its rugged neoprene jacket resists moisture, chemicals, sunlight, corrosion, electrolysis, abrasion and mechanical injury. It delivers real service dependability year after year.

And Durasheath is good for almost any job you have. You can bury it directly in the ground . . . run it in damp ducts . . . string it overhead . . . in *one continuous run* with minimum splicing. Order through your Anaconda Sales Office or distributor. *Anaconda Wire & Cable Company, 25 Broadway, New York 4, N. Y.*

*Reg. U. S. Pat. Off. 54366

ANACONDA®

Primary and secondary distribution cable • building wire • portable cords and cables • mine cable • magnet wire • copper, aluminum, copperweld conductors • signal, control and communication wire • wire and cable accessories.

C-45

BLUEPRINT for Teamwork

Stops Footwork! Keeps City-Phones Free!

Here's your blueprint for action—efficient *inside* action . . . a plan that puts your people *together* with a Kellogg Intercommunication System! Whatever your plant program may be—now or in the future—there's a guaranteed Kellogg System designed to handle your interior telephone traffic—automatically. Meeting all requirements, Kellogg Intercommunication Systems provide fast, direct connections—anywhere in the plant area.

And to help you achieve the best possible plan, Kellogg's nationwide counseling service is freely available through Kellogg's national dealer organization . . . equipped to demonstrate how Kellogg Intercommunication Systems pay for themselves through the time they save!

Fast! Direct! Automatic!

You go places fast with a Kellogg Intercommunication System! Simply flick a dial—you're instantly connected with key men and plant personnel. You can hold quick conferences—conversations are always private. Every station calls every other station without delay. Your city-phone switchboard is never burdened with inside traffic—customers can reach you instantly—your city-phone system is always free for those profit-making incoming and outgoing calls so vital to business success.

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KELLOGG Relaymatic . . .

For plants requiring 55 or more stations. Completely automatic, requires no switchboard, no operator. Gives you instant "priority service" to any part of office or plant. Provides for future expansion!

KELLOGG Select-O-Phone . . .

Swift inside telephone service for up to 55 stations. Saves time, steps, money!

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INTERCOMMUNICATION SYSTEMS

THE *INSIDE* VOICE OF BUSINESS

PLAN FOR TEAMWORK—NOW!

Your Kellogg dealer will gladly survey your inside communication problem, without obligation. Get the facts—send coupon today.

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Show us how we can Plan for Teamwork—How KELLOGG INTERCOMMUNICATION SYSTEMS will save us time, steps and money.

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COMPANY_____
ADDRESS_____
CITY_____ ZONE_____ STATE_____

NEW FREE CATALOGS

Begins on page C-36

110 · Intercom. These basic units can be used in numerous intercom systems. A 16-page booklet tells you how—with features of product clearly shown. Neat selection table inside back cover will help you pick the model you want. *Webster Electric Co.*

111 · Sound Signals. In this 40-page catalog you'll find how to select the correct sound signal for your application. Includes howlers, sirens, buzzers, and code devices. Charts show fundamentals of sound, and quick comparison guide for selection. *Benjamin Electric Mfg. Co.*

112 · Two-Way Radio. This 6-page folder shows you where you can use two-way radio communications to advantage. Lists features of product, and illustrates and describes accessory equipment. Specifications are included. *Bendix Radio Co.*

113 · Sound Signals. Application data and specifications are shown in 30 pages covering paging systems, bells, horns, sirens, and other signalling devices. Begins by telling you how to select signals from maker's line. *Federal Enterprises, Inc.*

114 · Paging System. This 4-page folder tells about a new paging system with electronically-controlled signals. Twelve additional pages of data on time recorders and other electronic signal systems. Application features. *International Business Machines.*

115 · Transformers. Transformers (250-500 kva.) designed to cope with increased load densities on distribution systems are featured in booklet B-6134. Construction details, data on windings and accessories. *Westinghouse Electric Corp.*

To get these catalogs, circle item numbers on the Reader Service card next to back cover.

NEW FREE CATALOGS

Begins on page C-36

116 · Power Tubes. A 12-pager that's a guide to power, and industrial rectifiers, photo tubes, and amplifiers. Engineering specifications for thyratrons, ignitrons, as well as high-vacuum rectifiers. Other useful information. *Westinghouse Electric Corp.*

117 · Wiring Equipment. Complete catalog describes company's electrical and machinery products. In it you can find everything from abrasives, cutters, demagnetizers, friction tape, and fuse pullers—to soldering tools and wire nuts. *Ideal Industries Inc.*

118 · Electrical Tools. This 84-pager (catalog No. 50—revised) shows you numerous cutters, pliers, clamps, wrenches, and other tools useful in electrical maintenance work. Tells how you can use each. *Mathias Klein & Sons.*

119 · Automatic Controls. Controls and valves are the subject of this 64-page catalog 700B. Includes automatic controls for pressure, temperature, liquid levels, plus magnetic and motorized valves. Complete specifications including dimensions. *Mercoid Corp.*

120 · Intercom. This 4-pager shows several ways of using makers' simple two-way intercom. Single remote station, any of 10 stations, or 3 to 24 stations at once, for example. Specs and applications. Photos and features. *Dalmotron Co.*

121 · Variable Transformers. These two catalogs show you 20 pages of the company's variable transformers, features, connection circuits, ratings, and full description of all types and models. (Bulletins P252 and P550). *Superior Electric Co.*

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FARADAY® CODED

FIRE ALARM SYSTEMS

Fast *detection* of fire—knowing both when and *where* it breaks out—is a secret to minimizing fire losses solved long ago by Faraday Coded Fire Alarm Systems. They not only warn of fire but *locate* it immediately.

For seventy-six years, plants across the country have been warned—*in time*—by Faraday. Through these years, Faraday has designed systems for plants of all sizes and solved hundreds of special alarm problems. For dependable fire warning systems, consult with Faraday. No obligation. Write for details.

Flush Pull Door. Stations also supplied in break-glass, semi-flush surface types, for indoor or outdoor installation.

Fire Alarm Bell of Underdome Uni-Pact design. Insures sharp, clear bell tone.

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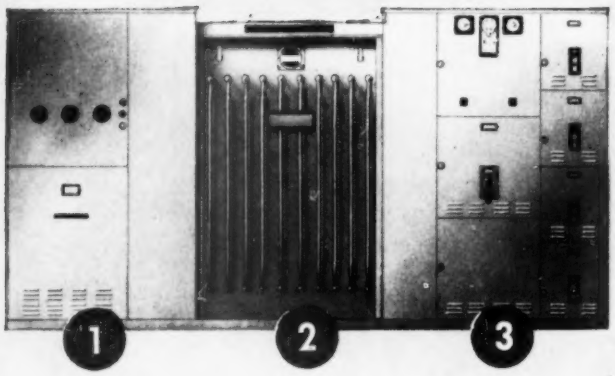
BELLS · BUZZERS · HORNS · CHIMES · VISUAL AND AUDIBLE PAGING DEVICES AND SYSTEMS



Another reason why General

THEY'RE EQUIPPED WITH

The low-voltage side of General Electric Load-center Substations is protected by Type AK air circuit breakers, which are co-ordinated with the transformer to give adequate protection against the greatest short-circuit current the transformer could possibly deliver. Three new AK breakers, with interrupting ratings from 50,000 to 100,000 amperes, together with AK breakers with interrupting ratings of 15,000 and 25,000 amperes give G-E load-center substations the most advanced line of low-voltage breakers available today. Many new engineering advances assure the superiority of G-E breakers.

DRAWOUT EQUIPMENT is specially designed for use in load-center substations—adds to attractive appearance of equipment. Completely co-ordinated compartments and breakers make the new design smaller and more compact. Standardized compartments provide greater flexibility, permit faster delivery schedules and lower maintenance costs. Structure frame, bus supports, bus and connections of the new equipment have been designed and *tested to withstand up to 100,000 amps short-circuit current.* Isolation of both control wiring and terminal blocks within steel troughs also means greater reliability and safety than ever before.

BREAKER-LIFTING DEVICE is available for easy raising and lowering of breakers. The lifting device may be left in position without interfering with the operation of the switchgear.

LOAD-CENTER SUBSTATIONS

Most dependable . . . because they are made from the finest components available.

1 AIR INTERRUPTER SWITCH

Thousands in service, many more than 10 years, with not one *reported electrical failure.*

2 PYRANOL* TRANSFORMERS

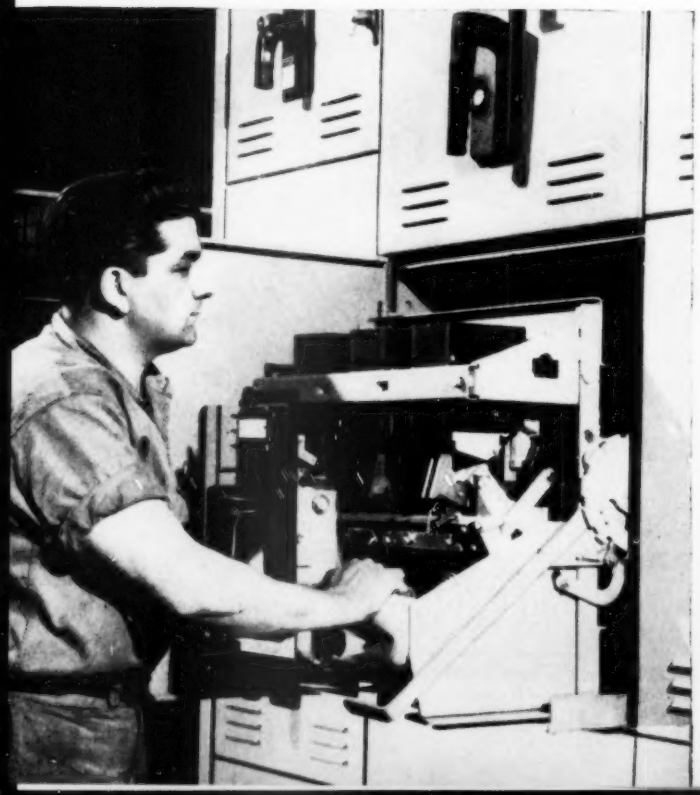
Less than one failure per 2500 transformer years.

3 NEW LOW VOLTAGE BREAKERS

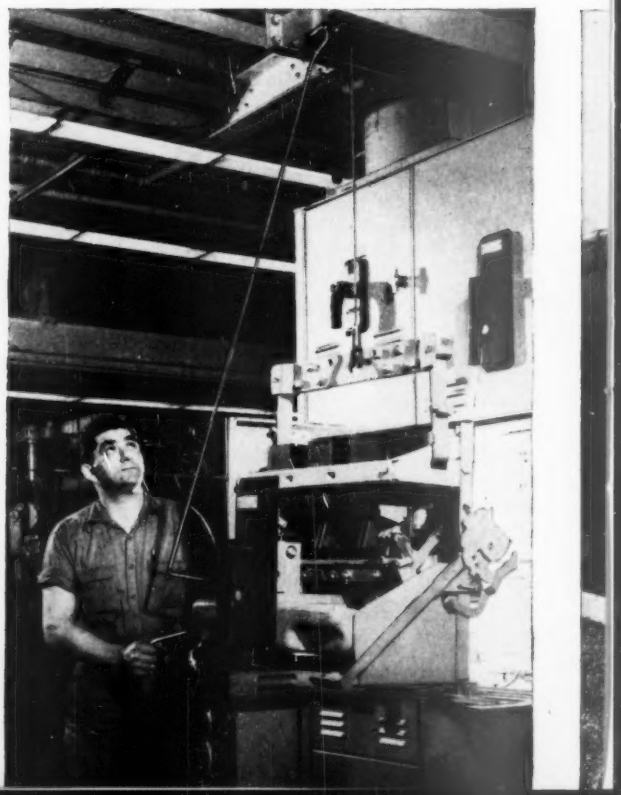
The safest, most reliable G-E air circuit breaker ever built.

*Reg. Trade-mark of General Electric Co.

BREAKERS ARE EASILY WITHDRAWN from compartments for inspection or maintenance. Racking mechanism is an integral part of the breaker for greater safety and reduced maintenance.



BREAKER-LIFTING DEVICE makes breaker handling easy. The device, operating on a simple windlass principle, can be left in position without interfering with breaker operation.



Electric Load Centers are the most reliable you can buy:

REVOLUTIONARY NEW AIR CIRCUIT BREAKERS

WEATHERPROOF OUTDOOR UNITS protect breakers from the elements. A thirty-inch lighted aisle in front of breakers makes it *possible for the operator to walk the entire length of the line-up with the outer doors closed.* An *aluminum lifting device* mounted in the top of the structure makes breaker handling easy.

STORED-ENERGY CLOSING MECHANISM in new breakers gives safer, positive closing even against fault conditions. Closing is accomplished by energy stored in a sturdy closing spring *even if control power is lost after closing action is initiated.*

SELECTIVE OPERATION *up to full interrupting rating* is now possible because breakers' 30-cycle momentary ratings are equal to full interrupting ratings. In a selective system triple-characteristic tripping devices open the correct breaker to *isolate a fault and keep the rest of the system in operation.*

MULTIPLE CONTACTS give faster arc extinction, longer contact life and reduced maintenance expense *by actually reducing arc energy to be interrupted.* An exclusive linkage in the contact mechanism braces contacts against the stationary pole unit so that short-circuit forces actually help hold the contacts together, instead of tending to force them apart.

INTEGRAL RACKING MECHANISM on new breakers *is on the removable breaker,* rather than on the enclosure. This makes maintenance easier and reduces the possibility of the operator coming in contact with live parts.

READILY ACCESSIBLE CURRENT TRANSFORMERS can be changed without disturbing bus connections.

INTERCHANGEABLE PARTS between new breakers greatly reduce parts stocking problems. The main physical difference between the three new breakers is the number of contact fingers per pole which increases with rating.

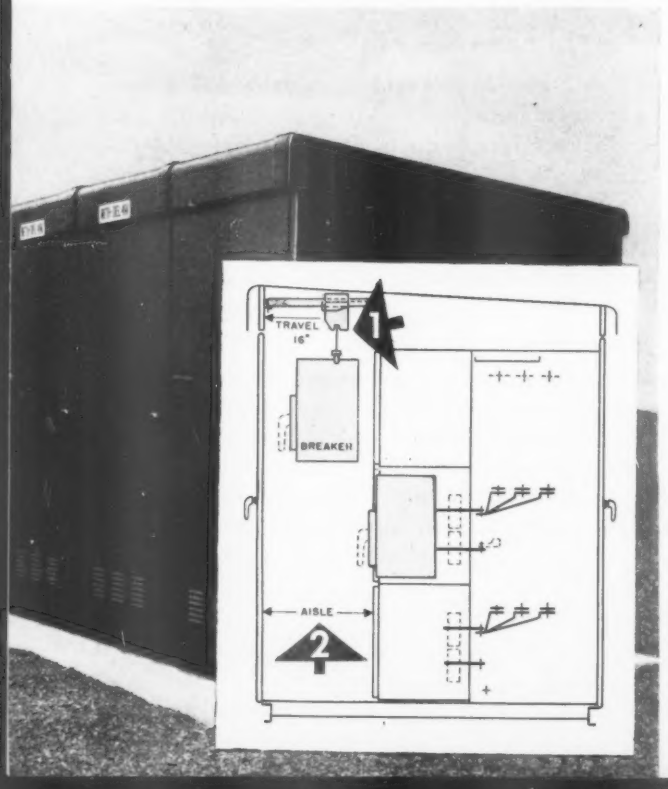
FOR MORE INFORMATION *about General Electric load-center substations, ask your G-E sales representative for bulletin GEA-3592 or write to General Electric Co., Schenectady, N. Y.*

881-5

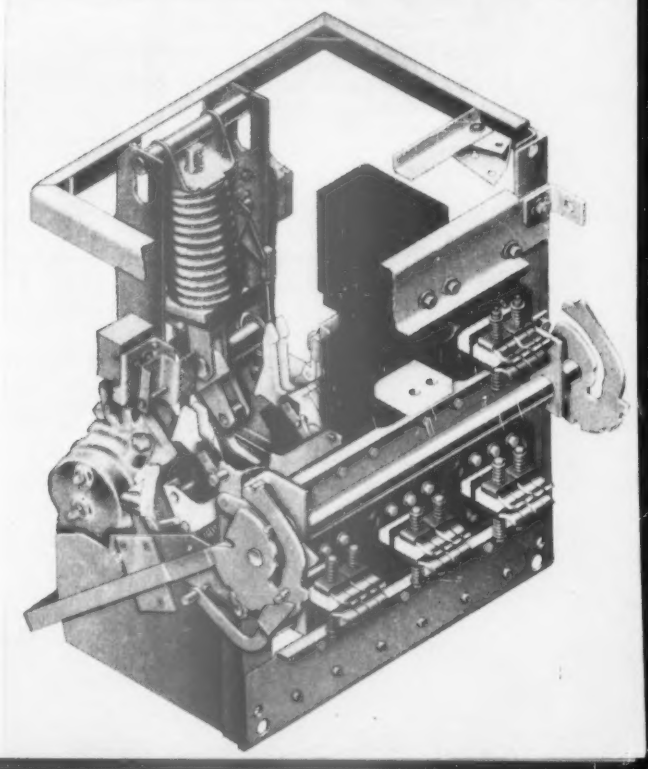
Progress is our most important product

GENERAL ELECTRIC

OUTDOOR UNITS are completely weatherproof. Aisle in front of breakers allows operator to walk length of compartment with outer doors closed. Lifting device in top of structure aids in removal of breakers.



STORED-ENERGY CLOSING MECHANISM, shown in color in this cutaway drawing, in new breakers gives safer, positive closing under any conditions with energy stored in closing spring.

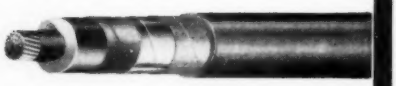


G-E cables to help solve

Because of increasing demand on power distribution systems . . . in new plants and in existing plants . . . properly selected cables are more important than ever before. Standard General Electric cables shown on these pages, and other G-E cables that are available, will help you answer today's needs . . . will help you meet tomorrow's requirements.

G-E No. 1799 varnished-cambric insulated interlocked armor cable. 0-5000 volts and 15 kv; single and three-conductor; aluminum, galvanized steel, or bronze armor.

For intermediate or high-voltage circuits installed above ground, you'll find that G-E V-c interlocked armor cable meets most conditions. It is lightweight, flexible, can be used indoors or outdoors, can be run easily around corners and over beams. To cut installation time and cost in new construction or old, use a V-c interlocked armor cable system for primary or secondary feeders, and for connecting low-voltage plug-in bus and power utilization equipment. G-E V-c interlocked armor cable is providing long-lasting, trouble-free service in many industrial plants today. Use the coupon to request complete information.



G-E Super Coronol Geoprene cable. Coated copper conductor; butyl-base insulation; shielding; oil-, acid-, alkali-, and sunlight-resistant jacket.

When the situation calls for intermediate or high-voltage circuits in ducts, conduit, raceways, in air, or for direct burial, install G-E Super Coronol* cable. This cable displays outstanding electrical and mechanical properties, and resists moisture absorption, aging, ozone, and heat. Super Coronol cable is available as single-conductor and multi-conductor, for various applications. For more information on how this cable can be used in your plant, use the coupon.

G-E Versatol Geoprene Cable. Heat- and moisture-resistant insulation, polychloroprene jacket. Wide range of conductor sizes.

For 600-volt circuits above or below ground, use G-E Versatol* Geoprene cable . . . in ducts, conduit, raceways, in air, or for direct burial. G-E Versatol Geoprene cable has heat- and moisture-resistant insulation and a tough, oil-, acid-, alkali-, and sunlight-resistant jacket. It is easy to handle, to splice, to terminate. Send the coupon for complete information on this useful cable.

your electrical modernization problems

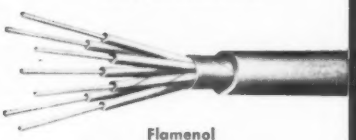
Deltabeston Cable. Solid or stranded conductors. Types available to withstand 125 C maximum copper temperature.

For low-voltage circuits exposed to high ambient temperatures, and for those installations where heat is a problem, a variety of Deltabeston* cables is available.

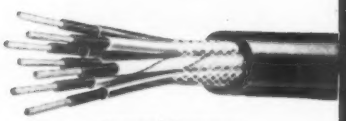
Insulation is felted asbestos, or felted asbestos in combination with varnished cambric. Exterior covering may be lead sheath, a braid of asbestos, or treated cotton. Mail the coupon to get the useful booklet that describes this full line of heat-resistant cables.

CONTROL CABLES

Meet IPCEA Specifications and NEMA Standards



Flamenol



Versatol Geoprene

Deltabeston

For control and instrument circuits, G.E. offers three types of control cables. They are long-lived and provide maximum reliability. These cables can be installed in ducts, on trays, can be carried by messenger or pulled into conduit. Deltabeston control cable can operate at high temperatures. Flamenol* and Versatol Geoprene can be used indoors or outdoors or buried directly in the ground. Use the coupon to secure more information.

Registered Trade-mark General Electric Company

You can put your confidence in—

GENERAL ELECTRIC

Section W139-634
Construction Materials Division
General Electric Company
Bridgeport 2, Connecticut

Please send me (Check the booklet you want)

The booklet describing: _____ **G-E V-c Interlocked Armor Cable;** _____ **G-E Super Coronol Cable;** _____ **G-E Deltabeston Cable;** _____ **G-E Versatol Geoprene Cable;** _____ **G-E Control Cable.**

Name _____

Address _____

City _____ **State** _____

TO BOOST CAPACITY 30 -50%

JUST CHANGE CABLES TO

ROCKBESTOS AVC®

(N.E.C. TYPE AVA)

You get long life, dependable service under severe operating conditions because these walls of impregnated felted asbestos permanently resist heat and moisture, mechanical damage and effectively seal the high dielectric varnished cambric tapes from deterioration.

Here's a fast, economical way to increase your existing current capacity. Just re-wire with Rockbestos A.V.C. Size for size, A.V.C. carries 30 to 50% more current than ordinary insulated cable.

Saves you buying and installing new conduit, new fittings. Lowers your labor costs. Takes less downtime to make the change-over.

And because it's a better insulated cable, Rockbestos A.V.C. gives you more years of dependable service, too. For the complete story, write for booklet "Cut Current Carrying Costs."

STOCKED COAST TO COAST

Standard Rockbestos A.V.C. constructions (N.E.C. types AVA, AVB, etc.) are available for immediate shipment. Call or write nearest branch office.

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..Your best buy

ROCKBESTOS PRODUCTS CORP.
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NEW YORK • CLEVELAND • DETROIT • CHICAGO
PITTSBURGH • ST. LOUIS • LOS ANGELES • NEW ORLEANS
OAKLAND, CALIFORNIA • SEATTLE

When electrical maintenance costs soar... don't jump on this man

Here's where to ease the squeeze:

1. Minimize production down time required for maintenance . . . use Westinghouse Life-Line Starters.

2. Reduce direct costs of maintenance men and materials . . . use Westinghouse Motors and Control Centers.

3. Turn maintenance of complicated electrical equipment over to your local Westinghouse Repair Service Plant.

HOW? SEE THE NEXT SEVEN PAGES

Deflate electrical maintenance costs by

stopping wasted production time

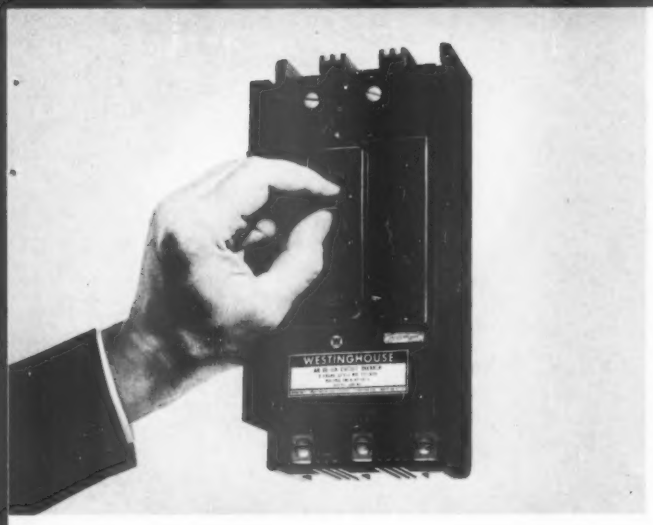
Down time can lick you—it costs and costs and costs. Power outages mean production stops. Machines are idled. Men are idled. Work in process piles up—or spoils—or dislocates assembly lines. You lose money until power is restored.

There are two compelling reasons why you should look into the problem of electrical down time. First, many outages are unnecessary—pure waste. Second, much outage time can be shortened. With Westinghouse Motors and Controls you get not only outstanding dependability, but the power and circuit protection for which you buy them.

Consider the Life-Line Starter. Knife-edge bearing make-break and disc-type overload relay are just two features that give reliable motor protection. Consider the Westinghouse Circuit Breaker. It will ride out *normal* overload surges, and save you one unnecessary outage after another. Or consider the Westinghouse Life-Line Gearmotor with permanently pre-lubricated bearings. Here's a real performer that thrives on neglect. It needs no maintenance.

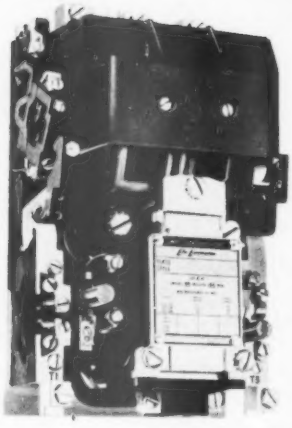
Preventive maintenance ideas come alive in these products. They're designed in because we know down time is the real cost of electrical maintenance. Do you know what maintenance down time is costing you?

YOU CAN BE **SURE**...IF IT'S



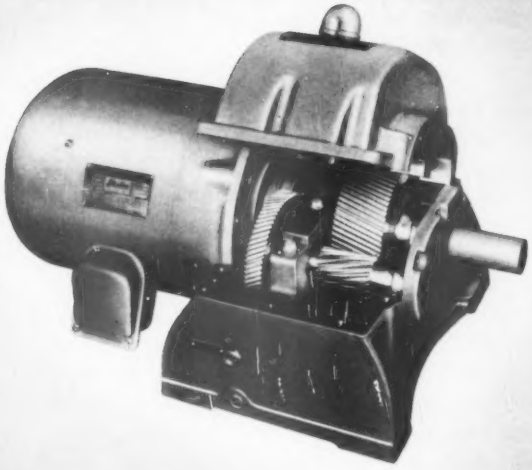
Westinghouse Breakers take just a flip of the handle

When circuit interruptions *are* necessary, Westinghouse Breakers snap to—give you instant protection. When circuits are clear, a flip of the handle puts you back into production. There is nothing to replace, no running after fuses or hunting up maintenance men. And there is no danger of over- or under-fusing. In Westinghouse Circuit Breakers you can buy protection that's built to be forgotten.



Front mounting components of Life-Line Starters make maintenance simple

Any part of a Life-Line Starter is easy to get at, and with just a screwdriver. Deep-drawn, lift-off cover exposes more of the mechanism than conventional designs—speeds wiring. All parts, right to the back pan, are all front removable. Straight-through wiring saves time hunting for "missing" terminals; line terminals at the top, load terminals at the bottom, are all front accessible. Pressure-type connectors end looping of wires. NEMA standard mounting dimensions and wiring sequence eliminate guesswork. For installation, replacement or servicing, Life-Lines give you a break every time.



Gearmotors feature split-case construction

All Life-Line® Gearmotors have gear case split horizontally. This means you simply remove a few bolts, lift the gear cover and all parts are accessible for servicing. There's no need to disturb the gearmotor mounting or drain the oil—no job of dismantling. This feature cuts hours off inspection and maintenance schedules. Full gear servicing can be accomplished without removing the drive motor.

Westinghouse

Deflate electrical maintenance costs by

eliminating waste motion

Have you ever made a study of the time your maintenance personnel spend traveling from one task to the next? This is nonproductive time. It's time that keeps pushing the cost of electrical maintenance higher and higher.

One way to eliminate this waste motion is to group motor controls into centralized areas with Westinghouse Control Centers. By just going to one spot, the maintenance man can service a large number of controls. No wandering throughout vast work areas. Access to the controls can be limited to authorized personnel.

On-the-job greasing of motors is another big time killer. Surveys show that it takes an average of 180 man-hours each year to grease 100 conventional motors. But, Life-Line Motors are equipped with sealed, pre-lubricated bearings. The cost of greasing Life-Line Motors is zero.

YOU CAN BE **SURE**...IF IT'S

Westinghouse Control Centers group control in one place

All controls for an entire system are centralized in one group of enclosures. With but a glance and a few steps, maintenance personnel can feel the pulse of over-all motor operation. Floors are cleared for action. Controls are separated from hazards. Flexibility of structural units and electrical components meets changing control needs.

Each vertical structure holds from one to five starter units. These units have standard dimensions and hold the breakers, starters and relays required for proper motor control. This standard design permits interchange of units within the structures. The structures themselves can be moved anywhere, any time. As machines are added or substituted, just add or substitute starter units.

Life-Line "A" Motors require no on-the-job greasing

Life-Line "A" Motor bearings are lubricated under exacting conditions at the bearing manufacturer's plant. The right grease, in the right amount is SEALED in. New 4-way seal keeps out dust, dirt and other foreign elements. Outer seal acts as a flinger. Inner seal forms positive labyrinth joint.

New fortified insulation helps protect Westinghouse Life-Line "A" Motors. Bondite, a silicone-reinforced thermoset varnish, resists water, oil and chemicals—either liquid or vapor. Bondar, a new wire insulation, resists heat.

Bracket openings are located in the under-quadrant for maximum protection. You can rotate the brackets for wall or ceiling mounting. Circumference of frame is completely enclosed so that it remains dripproof in all positions.

Westinghouse

Deflate electrical maintenance costs by

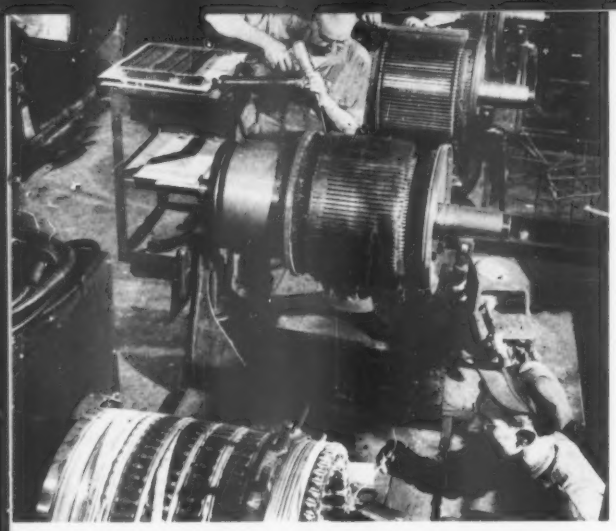
avoiding complicated in-plant repairs

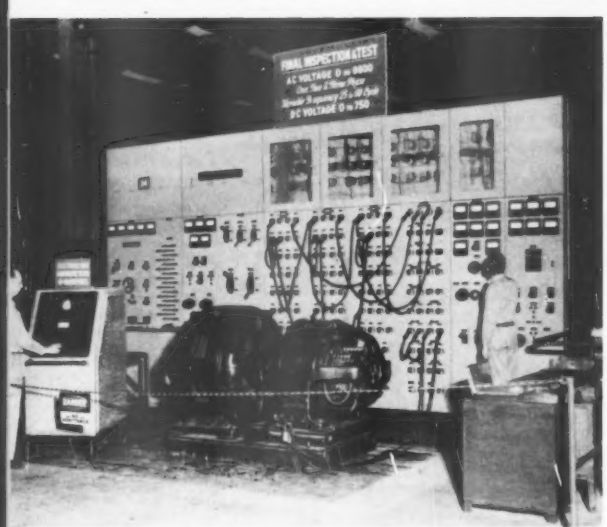
Turning your hand to complicated repair jobs in your own plant might well be the reason for soaring maintenance costs. Not only do you tie up men and valuable floor space but limited facilities and improper techniques cause long down-time periods. The quality of repair work often suffers.

It takes highly skilled men, thoroughly familiar with your complicated equipment and working with specialized tools to assure fast, proper repairs. Westinghouse is set up on a nationwide basis to meet these maintenance needs. Expertly manned, fully equipped Westinghouse Repair Plants are constantly at your service. Westinghouse Engineers will quickly and accurately analyze your repair problem. They'll see to it that, whenever possible, your production line can keep humming with replacement equipment while repairs are being made.

When repaired by Westinghouse, your equipment is installed back on the line as good as, if not better than, new. No headaches or costly maintenance.

YOU CAN BE **SURE**...IF IT'S





Westinghouse has the men

In each of the 38 Westinghouse Repair Plants spotted across the nation there are repair specialists ready to effect fast and quality repairs on your equipment. The experience of these specialists is vast for Westinghouse makes a broader line of electrical equipment than any other manufacturer. As a result, Westinghouse repair personnel are well qualified to service your equipment.

Westinghouse has the materials

Materials used in all Westinghouse Apparatus Repair are the same as those used in building new equipment. Genuine Renewal Parts, kept in full stock at 31 Parts Warehouses, help bring rebuilt apparatus up to new equipment performance standards. Wherever possible, the latest improvements in materials are incorporated in the repair of your equipment.

Westinghouse has the machines

All Westinghouse Repair Plants have machine-shop facilities and testing equipment to complete the most complicated repairs. Westinghouse employs specialized and standardized repair methods with quality control checks that assure maximum performance for every repair job. For greatest speed, assembly-line methods are used when possible.

Westinghouse

Maintaining your own repair facilities involves these cost factors

SUPERVISION

DEPRECIATION, TAXES, INSURANCE OF BUILDINGS AND EQUIPMENT

HEAT, WATER, POWER, LIGHT

TRANSPORTATION

IDLE TIME

CORRECTION OF DEFECTIVE REPAIRS

WORKERS' INSURANCE AND PENSION PLANS

Let's discuss Westinghouse next time I call

We've made careful cost studies with a number of companies who discovered it was cheaper to use their own men only on preventive maintenance and have Westinghouse make all apparatus repairs. We'd like to talk this over with you.

MP-3038

YOU CAN BE SURE...IF IT'S

Westinghouse

Industrial Products Advertising
Westinghouse Electric Corporation
3 Gateway Center, Pittsburgh 30, Pa.

Name_____

Company_____

Address_____

City_____ State_____

Please send me these books:

- ☐ New Life-Line "A" Motor.....(B-6154)
- ☐ Westinghouse Gearmotors .....(B-5645)
- ☐ Automatic Control.....(B-5882)
- ☐ Complete Industrial Control.....(B-6051)
- ☐ Control Centers .....(B-5621)
- ☐ Preventive Maintenance.....(B-5477)

The answer to complete lighting flexibility

Fluorescent lighting on Universal Trol-E-Duct installation at Ford Motor Company's Buffalo Stamping Plant, Hamburg, New York

FORD MOTOR USES TROL-E-DUCT® —6¼ MILES OF IT!

BullDog Universal Trol-E-Duct lets Ford add, move or remove lights anywhere, anytime, without rewiring. Here's true flexibility that meets any requirement from a fixture change to a completely new floor layout.

Every rugged inch of durable BullDog Trol-E-Duct provides available easy-to-tap current. Simply slip twistout plug into continuous slot—instantly you get a positive connection without disrupting power. What's more, the 50-ampere rating of the copper bars assures ample provision for future growth.

Prefabricated duct sections install easily, quickly with only a screw driver. Can be dismantled and installed elsewhere, with never a wasted part.

For the answer to your lighting problem, check with your local BullDog Field Engineer. Or write for free bulletin UT-650. BullDog Electric Products Company, Dept. FM-64, Detroit 32, Michigan.

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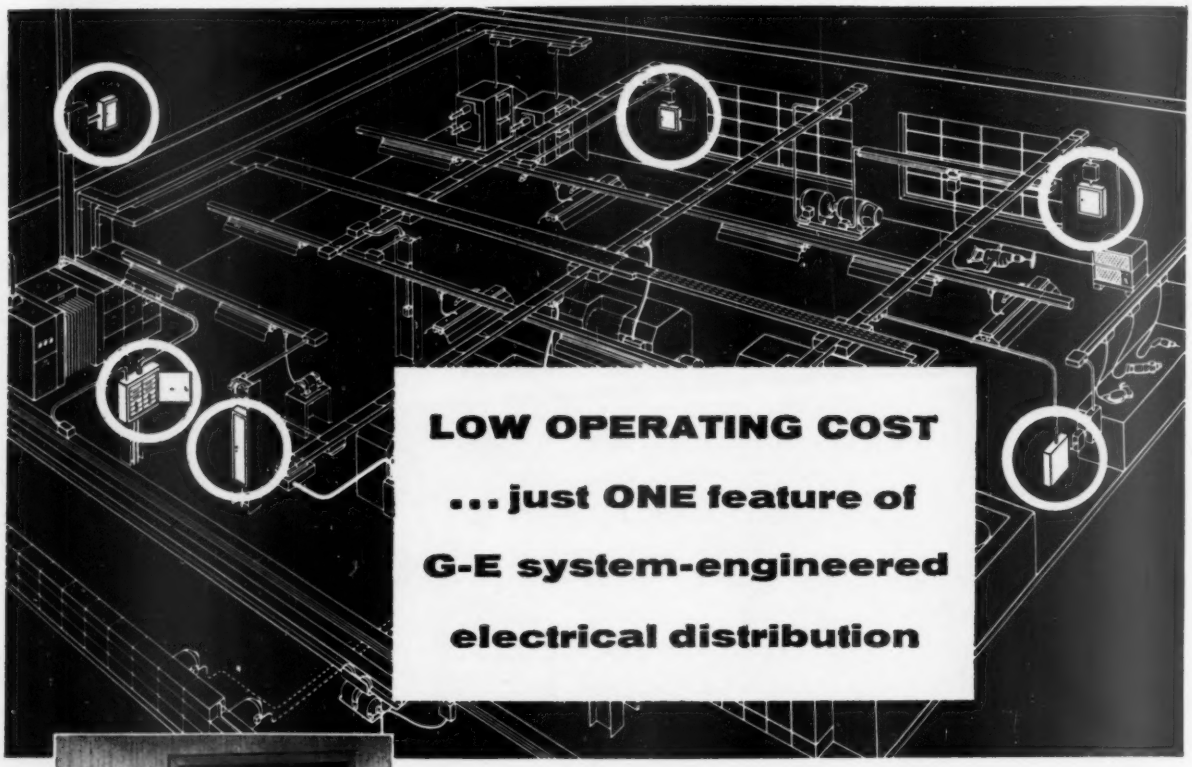
BULLDOG
ELECTRIC PRODUCTS COMPANY



LOW OPERATING COST

... just ONE feature of G-E system-engineered electrical distribution

A hodgepodge of circuits and controls means power losses and costly maintenance. Eliminate this needless expense with a complete *integrated* General Electric secondary system. Other major advantages: increased safety, ease of relocating machinery and equipment, and reserve power capacity for your future needs.

For details write General Electric Company, Distribution Assemblies Department, Plainville, Connecticut.

G-E Lighting and Distribution Panelboards are available in a very broad range of fusible and circuit breaker types. G-E engineers can help you double the value of your investment by selection of the correct panelboard, by provision of capacity for future needs, and location for maximum efficiency in the complete system.

G-E Motor Control Centers, with instantly accessible all-purpose plug-in units, increase operating efficiency today and assure you of continuing ability to meet tomorrow's requirements.

G-E Flex-A-Power copper or aluminum busway systems actually cost no more installed than less versatile conductors. They can be altered, extended, dismantled and re-installed quickly and easily with complete re-use of all units.

From power line to production line, make it G.E. all the way.

GENERAL ELECTRIC

PLANT SERVICES

IN

195X PLANT

SECTION D—INDEX

Two basic tools for 195X planning ...

A-B-C Rating Chart for Plant Services D-2

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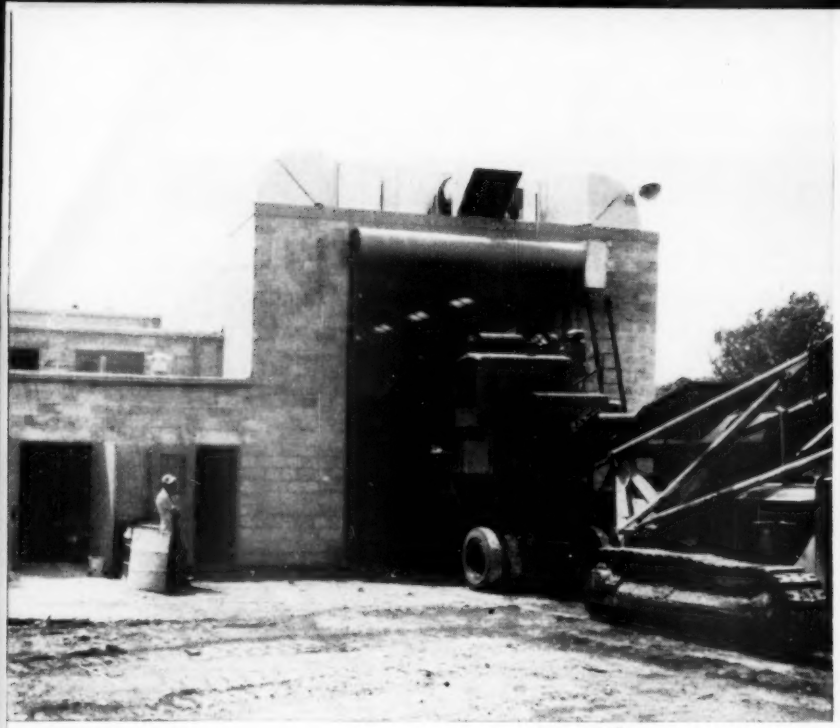
FACTORY's [illegible] FOR PLANT

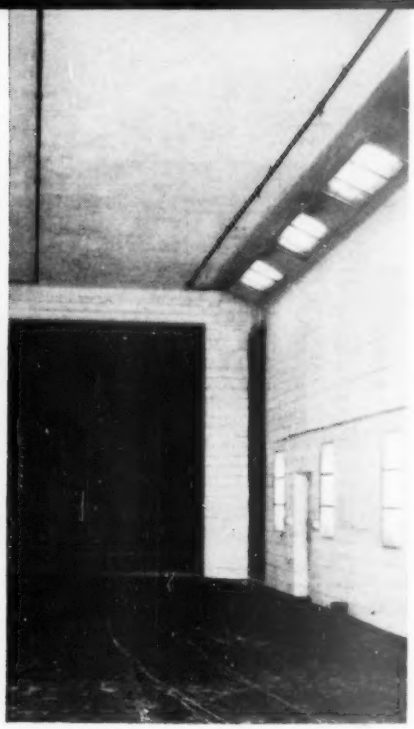
INSTRUCTIONS. Rate *A* for excellent, *B* for fair, *C* for poor. Skip squares if items or headings are not applicable. A row of *A*'s means you're in good shape. A row of *B*'s and *C*'s points to the need for action.

	DO YOUR RATING IN THESE COLUMNS . . .								CHECK ACTION HERE . . .				
									WHAT			WHEN	
	PHYSICAL CONDITION	CAPACITY FOR PRESENT NEEDS	CAPACITY FOR NEXT YEAR	CAPACITY FOR 195X	OPERATING COSTS	MAINTENANCE COSTS	OUTLOOK FOR LONG SERVICE	DEPENDABILITY FOR MINIMUM DOWNTIME	REPAIR	REPLACE	ADD NEW	NOW	LATER
[illegible]	A	C	B	C	C	B	B			✓			
AIR HANDLING													
1 • Air conditioning													
2 • Space heating													
3 • Ventilation													
4 • Humidification and dehumidification													
5 • Exhaust systems													
UTILITIES													
1 • Water pretreatment													
2 • Water storage													
3 • Water conservation													
4 • Gas generating systems													
5 • Gas pressure storage													
6 • Central power house steam													
7 • Package generator steam													
8 • Fuel storage													
9 • Lighting													
10 • Utility pipelines													
11 • Process pipelines													
12 • Emergency and standby													
DISPOSAL FACILITIES													
1 • Anti-air pollution (dust, vapor, fumes, odors)													
2 • Effluent disposal (process and sanitary)													
3 • Refuse disposal													
4 • Recovery and salvage													
AUXILIARY PROCESS EQUIPMENT													
1 • Drying													
2 • Heating													
3 • Cooling													
4 • Refrigerating													
5 • High-pressure													
6 • Vacuum													
AUXILIARY MECHANICAL EQUIPMENT													
1 • Fans													
2 • Pumps													
3 • Compressor													

SERVICES . . . FOR YOUR 195X PLANNING

	DO YOUR RATING IN THESE COLUMNS . . .								CHECK ACTION HERE . . .				
									WHAT			WHEN	
	PHYSICAL CONDITION	CAPACITY FOR PRESENT NEEDS	CAPACITY FOR NEXT YEAR	CAPACITY FOR 195X	OPERATING COSTS	MAINTENANCE COSTS	OUTLOOK FOR LONG SERVICE	DEPENDABILITY FOR MINIMUM DOWNTIME	REPAIR	REPLACE	ADD NEW	NOW	LATER
4 • Evacuators													
5 • Power transmission													
6 • Vibration control													
MAINTENANCE FACILITIES													
1 • Maintenance shops													
2 • Lubrication equipment													
3 • Sanitation and cleaning equipment													
RAW MATERIALS STORAGE													
1 • Dry storage													
2 • Tank farm													
THERMAL INSULATION													
1 • Pipelines and tanks													
2 • Process equipment													
3 • Service equipment													
CORROSION PREVENTION													
1 • Protective coatings													
2 • Cathodic protection													
EMPLOYEE FACILITIES													
1 • Washrooms, locker rooms, etc.													
2 • Food services													
3 • Health & recreation													
4 • Transportation													
5 • Safety													
6 • Music													
PROTECTION FACILITIES													
1 • Plant security													
2 • Theft prevention													
3 • Sprinkler system													
4 • Alarm system													
5 • Built-in extinguishers													
6 • Disaster control													
OTHER SERVICES													
1 • Instrumentation													
2 • Test facilities													
3 • Inter-com systems													
4 • Timekeeping systems													
5 • Noise abatement equipment													





How 22 Plants Have Improved Their Plant Services

By CARL G. WYDER
Maintenance Editor
FACTORY

1 **A separate paint spray building** (exterior, left; interior, right) solved a complex production, personnel, and maintenance problem for Pioneer Engineering Works, Inc., Minneapolis. It handles construction equipment (nearly the size of a box car) which can't be painted in the main plant.

The building is divided into three single-story areas—two 20x20x60-ft. paint "booths" flanking each side of a slightly wider central area containing foreman's office, washroom, paint storage and mixing rooms, and service aisles. Safety features of the booths include explosion-proof equipment and lighting fixtures, sprinkler system, fire dampers in ducts, and air hoists. Power-operated roll-up doors at both ends of each booth permit a straight-through movement of equipment, thus cut processing time.

Employee morale got a boost by careful design of the heating and ventilating system which maintains clean, safe, and comfortable atmospheres. All exhaust air is filtered to remove overspray, resulting in better relations with neighbors and employees. Half of the 20 double sets of filters need changing every 2 weeks.

Other benefits: Improved lighting has led to better and faster painting. Larger booths give more elbow room, allow painters to move around faster and more freely.

2 **Soundproof rooms**—two of them—were needed in Beltone Hearing Aid Co's. new plant in Chicago for research and testing. They are actually rooms within rooms, with areas of 31x20 and 10x 15 feet. The inner room doesn't touch the outer room except where it is mounted on Barry synthetic rubber shock mounts. Two inches or more of air space separates the room elsewhere.

Walls of inner and outer rooms are insulated by spun glass. Air conditioning, heat, and light are brought in through flexible connections. Junction boxes on inside and outside walls are connected by flexible coiled wiring. Ducts have canvas connections, and are lined with Owens-Corning Fiberglas to a point 30 feet away.

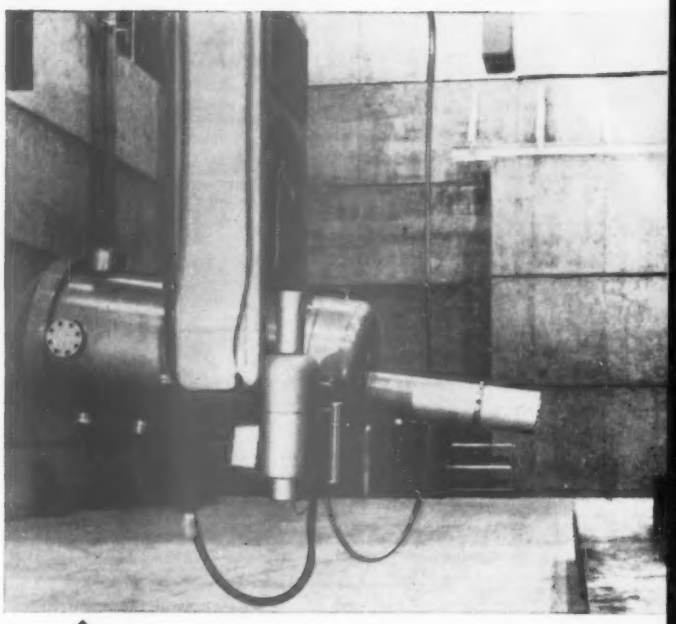
Double Riverbank sound-insulating doors form the entrance. There is an air space between these doors. Ceiling and walls of each inner room are fully lined with perforated Masonite acoustical tile. The floor is covered with 3/16-in. cork on top of acoustical tile.

3 **Washrooms and locker rooms** got a "new look" in the $10-million plant modernization and expansion program just completed by Standard Pressed Steel Co., Jenkintown, Pa. As a result, the cost of sanitary maintenance has dropped to half. But of greater importance, says SPS, is the effect on worker attitudes and productivity, and on quality of product.

Some four years ago an employee survey showed some dissatisfaction with sanitary facilities. Washrooms were too far from production areas. Some of them were untidy. So SPS scrapped what many plants would still consider standard facilities—good fixtures, concrete floors, painted walls, slate partitions. It built two large locker rooms with washroom and toilet facilities, and added twelve smaller local washrooms throughout the plant.

In the main locker room each employee has a full-length locker with peaked top and solid concrete base. Walls are glazed tile, floor is slipproof tile. Equipment includes locker benches secured to floor, stainless-steel circular wash basins with powdered soap dispensers, and motor-operated window sash to promote good ventilation.

Local washrooms are "country club" type, with pastel-colored wall tiles and partitions, dual-type stainless steel basins, large-size mirrors, overhead acoustical tile, and patterned tile floors. Women's washrooms (see photo) even include lipstick tissue dispensers. Through the door you can see part of a lounge room that adjoins each women's washroom, furnished with comfortable leather upholstered sofas and chairs. No smoking is allowed in any washroom. This rule contributes to the spotless standard of cleanliness SPS has set, and all employees seem happy to cooperate in maintaining that standard.



4 **Two-million-volt X-ray equipment** was part of Foster Wheeler's improvement program at its new Mountaintop (Pa.) plant. Photographs by this super-voltage Van de Graaf machine—originally developed for cancer research—will expose minute flaws in steel up to 12 inches thick. Fewer and shorter exposures make capacity of this tool greater than conventional X-ray equipment.

To guard against the possibility of escaping rays, the equipment is housed in a fortress-like structure of puddled concrete and steel located 550 feet from the main plant. Walls are 4 feet thick, rise to 35 feet on the side facing the plant, and to 25 feet on all other sides. The door, also thick concrete, provides for entry of a flat-car on rails. It weighs 108 tons, is mounted on rollers and operated by motors. Personnel enter the inspection and developing sections through a maze of walls.

The support that holds the X-ray machine body permits vertical rotation of 180 degrees and 360 degrees horizontally. A desk-type console in a separate room controls its movement and operation anywhere over the room area to a height of 24 feet.

5 **Air locks** keep outside warm or dusty air from rushing in whenever a person enters or leaves the air-conditioned area at the new Boston plant of Doelcam Corp. Tolerances of the mechanisms assembled there are so close that a slight variation in air conditions would cause misalignment.

The air locks are essentially vestibules about 10 feet long and 7 feet wide with a self-closing door at each end. Thus, in the time it takes a person to traverse the air lock, the first door has closed before the second one is opened. They were designed by Lockwood Greene Engineers, Inc.

More on next page

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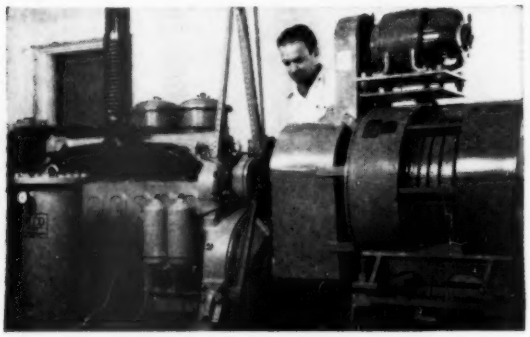
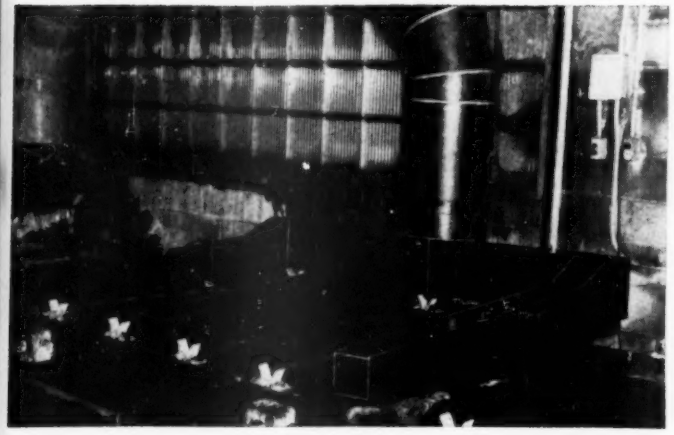
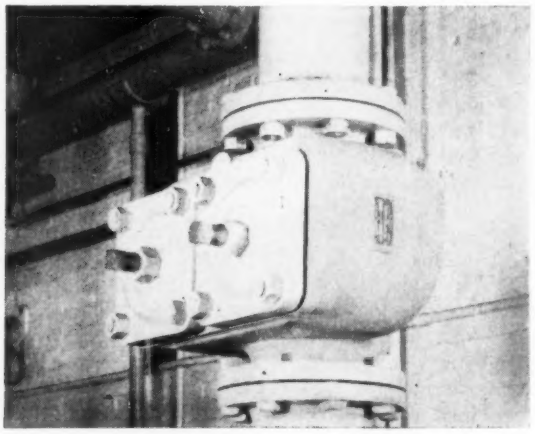


6 **Standby unit** helps earn its keep at Electric Regulator Corp., Norwalk, Conn., by supplying power for test generators and other equipment. Prime purpose of the 80-kw. GM diesel-generator, however, is to insure operation of the 200-man plant at full capacity should utility power fail. Last winter an ice storm caused a long power outage, curtailed production of critical materials for several days. In a recent test, regular utility power was turned off and plant was operated for several hours on power from this unit.

7 **Access cover design** allows quick and easy removal for inside cleaning of process duct systems at Pabco's Redwood City (Calif.) plant. Cost is 40% less than that of a conventional cover, according to Bob Hipp Welding Co. (Menlo Park, Calif.), which designed it. Ductwork is of 10-gage steel—covers are of 1/4 in. plate, 24 inches square. You loosen two L-bolts on each of the two crabs, move the crabs free—and off comes the cover. Where tight seal is needed, as at Pabco, covers are fitted with rubber gaskets.

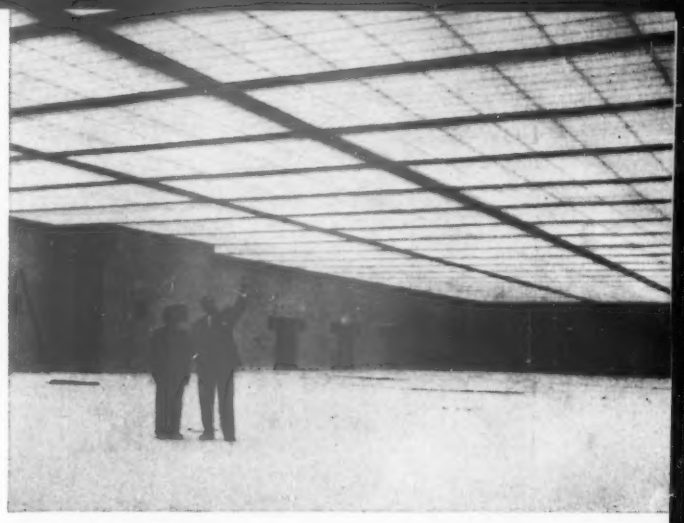


8 **Polyethylene fabrications** are solving many chemical corrosion problems. They range from tank liners, hoods, and exhaust systems, to complete pipeline assemblies. This material is inert to many corrosives, and extremely light—1/13th the weight of lead—yet almost unbreakable. It breaks down above 160F. The triple lateral exhaust hood (above) was made for Parker Rustproofing Company, Cleveland, by American Agile Company, Bedford, Ohio. It replaced a costlier stainless steel installation that had been corroded by hydrochloric acid fumes. And it is still giving good service 5 years after installation.

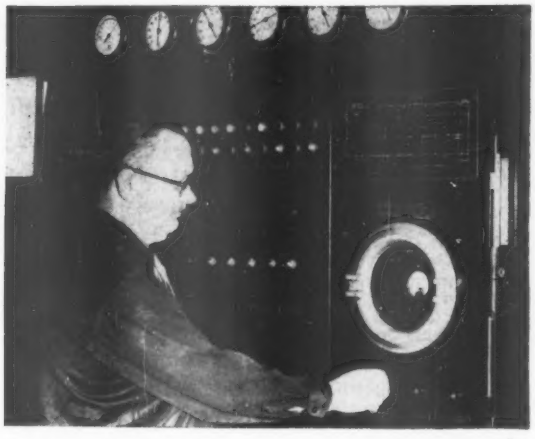


9 **Compressed-air discharge lines** from each of two compressors at Addressograph-Multigraph Corp., Cleveland, no longer vibrate since the installation of two Airchek valves. Previously compressor pulsations caused leaking pipe joints and annoying building vibration. No amount of changes in pipe supports or anchoring would help. The air check valve (Pennsylvania Pump & Compressor Co., Easton, Pa.) has eliminated noise and vibration, and simplified starting and stopping of compressors without a hand-operated shut-off valve. Also A-M can be sure compressor is without load during all idle periods.

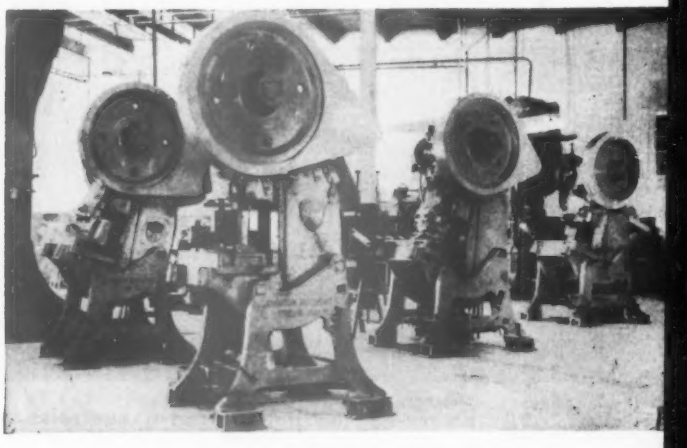
10 Enlarged maintenance shop and equipment put a big dent in maintenance costs at Parker Pen's new Janesville (Wis.) plant (See p. B-20 in this issue). Previously the department was cramped for space, and what space it did have was spread in a number of different locations. Consolidation into a well-lighted, air-conditioned area boosted supervisory and worker efficiency. Added equipment made it possible to handle more work than could be done before. There is less farming out of jobs that can be done cheaper at the plant.



11 Shadowless lighting relieves chances of eyestrain in the 96x350-ft. drafting area at the new Ford Research and Engineering Center at Dearborn. Despite an average intensity of 112 footcandles at table level, there is no glare. The system was installed by Smithcraft Lighting Division, Chelsea, Mass. Egg-crate louvers are laid into a suspended framework. Above this are located air conditioning ducts and outlets, and other services; also an acoustically treated ceiling to minimize distracting noises.



12 A combustible-vapor detection system guards the research facilities of Standard Oil Development Co., at Linden, N. J., against disaster from explosion. The master panelboard continuously analyzes air samples drawn from inlet ducts of exhaust systems near potential danger points. Howler alarm and signal light go on when concentrations reach 20% of the lower explosive limit. The system (Mine Safety Appliances Co., Pittsburgh) is so sensitive that a gasoline-soaked rag dropped near a sampling point will set off the warning signals. Maintenance checks are made just that way.



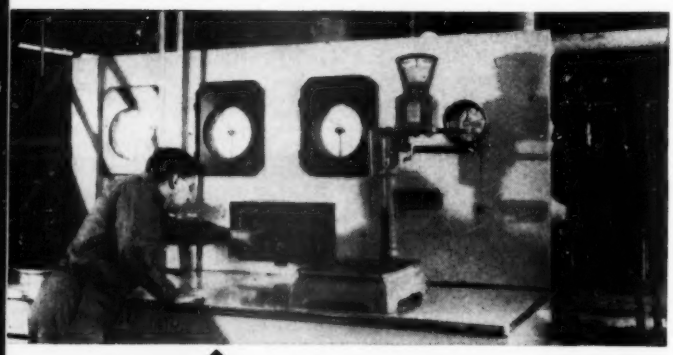
13 Vibration control units make punch press relayouts a simple job for Wells Specialty Co., North Liberty, Ind. They are cemented to the floor —no foundation bolts are needed.

But that's not all. The high-speed presses don't crack the concrete floor, or shake dishes in homes several hundred feet away as they used to do. Also worker efficiency has improved under these calmer conditions. The punch presses are mounted on steel-spring Vibro-Isolator units (Korfund Co., Inc., Long Island City, N. Y.). The units are first cemented to felt pads ⅛-in. thick.

More on next page

Begins on page D-4

14 **Industrial TV** has boosted the quality of steel strip at the Gary sheet and tin mill of U. S. Steel Corp. And it's checking costly production delays. A closed-circuit installation of camera, monitor, and receiver (made by RCA) on the 80-in. hot-strip mill allows the operator a clear view of the steel strip as it travels 395 feet from finishing stand to coilers. He can spot and correct any trouble before it leads to cobbles and pile-ups. This vigilance preserves product quality and avoids production tie-ups that may last up to 15 minutes — or cause a loss of 120 tons.



15 **Finger-tip location of batch controls** at centralized stations is responsible for higher output and better quality products at the Mennen Company plant, Morristown, N. J. Shown above is one of several "central" control stations that have simplified production control. It eliminates walking from place to place to operate valves and switches, or to note processing temperatures.

The pushbuttons on the vertical panel control the kettle agitators, mixers, and pumps. Temperature recorders are set above them at the height of operator's vision. A measuring tank for batch additives is close by the station, also serves as a reservoir from which liquids are pumped to the kettles instead of being carried by an operator.

16 **An extensive intercom system** keeps Armco's 80-in. hot-strip mill in its new Ashland (Ky.) plant on an even keel. Operators depend heavily on it for rapid interchange of instructions. Their coordination—hence efficiency—would suffer without it. Even the crane cab operator at the soaking pits is connected with other units.

Actually there are four wired sections in the system, each with its own power-amplifier unit. The first section provides communication between the delay recorder and tally man, roughing mill pulpit, foreman's office, finishing mill pulpit, coiler, piler pulpit, and stations on the floor. The second section connects the delay recorder and tally man, crop shear pulpit, scarfer, slab mill pulpits, and soaking pits. These two systems can be tied in with a flick of the switch to cover complete operations from the soaking pit to the piler.

The third and fourth sections connect the roughing and finishing mill pulpits with their respective motor rooms for use in start-up and shut-down preparations. In addition, trolley phones of the carrier-current type at the soaking pit control those operations.

17 **A dust collection system** has made possible the dust-free unloading of powdery products from rotary vacuum dryers at the Lederle Laboratories Div., American Cyanamid Co., Pearl River, N. Y. Savings in dust recovery are a bonus benefit.

To unload a dryer, an operator pulls the product out of the mouth with a hoe into a hopper below. Formerly particles of dust would billow into the air and spread over the department. Workers naturally didn't like this condition.

Now you don't see any dust. An exhaust hood at each unloading point gently overcomes surrounding air currents, and sucks any wayward dust particles into a Dustube cloth filter collector (American Wheelabrator & Equipment Corp., Mishawaka, Ind.). At predetermined intervals the accumulated dust in the tube filters is mechanically shaken down into hoppers and returned to the process.

18 **Service tunnel** distributes all power and piping services anywhere on the 42,000-sq. ft. floor of the Foxboro Co., Ltd., plant near Montreal. It also carries the major drainage system, and serves as an air duct for below-ground cafeteria and kitchen areas. Tunnel is 7 feet square, runs 144 feet for the full width of the building.

Transverse fiber-duct conduits connect the tunnel to any point on the floor. These conduits were buried under the factory floor in groups of three at regular spacing. When hooking up services to a new machine, it's just a matter of drilling down into the conduits and making the connections. Identifying markers in the floor simplify spotting the conduit lines.

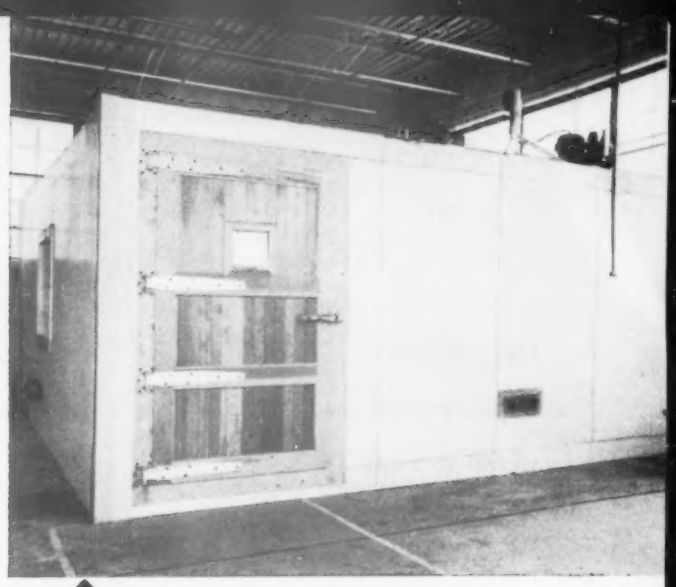
19 **Need more plant space?** Melin Tool Co. (Cleveland) solved this problem—and a plant heating problem—by installing electric unit heaters. Junking the old central boiler, circulating fan, and distribution ductwork freed some 8700 cubic feet of space.

With the old system, worker efficiency always dropped on cold days. There were consistent cold spots throughout the 6300-sq.-ft. area. Work conditions near the windows were especially difficult.

The new system has removed these discomforts. Plant is warm at start-up time. Temperatures are stable throughout. Work accuracy has improved.

The system consumes a total of 92 kw., or about 1.3 kw. per employee. There are six 10-kw. Electromode overhead heaters—one at each of the four corners of the plant, and one each at middle length —for perimeter heating. There are two 15-kw. units in the center area, also a few small portable and wall-mounted office units. The center units are used only from 5-7 a.m. as boosters to help warm up the plant.

Cost was $4200 installed. Operating and maintenance costs for last season, based on an average rate of 1.8¢ per kwh., ran less than 60% of old costs. Some of this saving was obtained by insulating the ceiling and part of the glass sidewall area.



20 **Temperature control** for an assembly operation doesn't always require an expensive setup. Flexonics Corp., Elgin, Ill., assembles its brass bellows in this box-like structure which is kept at a constant 70 F. It built this 400-sq.-ft. chamber of wood, with cork and glass insulation. For the entrance it used a standard refrigerator door. The window seen in the door was added as a safety precaution.

21 **Aluminum welding fittings** saved Esso Standard Oil Co. about $50,000 in a retubing job of wax cooling units at its Baton Rouge refinery. The only reason Esso hadn't been using aluminum instead of copper tubes for this service was the absence of any known technique to weld thin-wall tubes to fittings. But Alcoa's Development Division and Tube Turns' Engineering Service Division recently developed a new aluminum brazing technique; using a double-tipped oxy-hydrogen torch. Fabrication time was the same as for copper. Thereupon Tube Turns (Louisville) produced 90-deg. elbows and 180-deg. returns of Alclad 3S-F alloy for the job. Size was 1 inch OD with 0.065 wall.

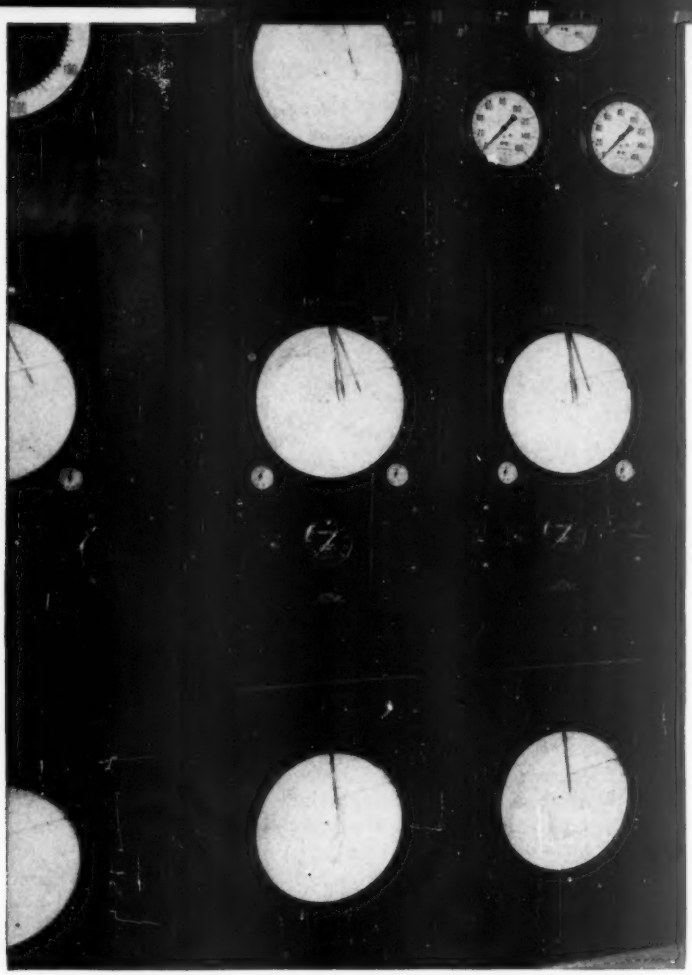
22 **Intra-plant telephone system** (called Dial-X) just announced by Stromberg-Carlson Co., Rochester, N. Y., promises some interesting and time-saving advantages.

Ever make a rush call and find the line busy? With Dial-X you don't have to hang up and try again. You hang on and get your man the instant the line is free. Yet every connection is a private line. There's no danger of being overheard, unless you arrange for a conference call—which you can do up to the limit of capacity.

At night when switchboard operator is away, your men can dial a paging line, and do their own plant paging. Key executives can be equipped with a right-of-way signal for use when they hit a busy line. They simply press a button which gives the other caller a warning and then cuts in the executive priority call.

Long-range improvements to plant services help keep . . .

40-Year-Old Plant Ready for 195X



NAME: Minnesota and Ontario Paper Company
LOCATION: International Falls, Minn.
PRODUCTS: Paper, pulp, and wood-fiber insulating board.
EMPLOYEES: Over 2000.

Since 1945 a person could seldom walk on Mando property without seeing some major plant improvement under way.

Why did Mando (short for Minnesota & Ontario Paper Company) spend almost $6-million for modernization and improvement in 1953?

Why has it spent nearly $40-million for product diversification and plant modernization since 1945?

And why does it plan for new and better facilities in the future?

The answer: Mando management believes that only a long-range program of this kind will keep it abreast of stiff competition, and enable it to share in the leadership of the industry. To stay at the top, it says, it must continually search for new products and new techniques, purchase new facilities, and replace worn-out equipment. It must explore ways to increase plant efficiency, develop new methods, and provide working conditions that insure best worker effectiveness.

In pursuit of these beliefs, Mando has made many improve-

A SIGNIFICANT TO GUIDE YOUR

ments in all its five plants. At the oldest of its plants, that located at International Falls, Minn., Mando has made the most improvements in terms of size, cost, and number. Among them were improvements in productive facilities, such as modernization of all three paper machines, a new wood-fiberboard machine, a new pulp bleachery, and various new materials-handling systems.

But improvements in plant services and facilities also played a large part in the program for making plant operations faster and more efficient, and for getting a better product. Some of the changes alone justified their cost by decreased operation and maintenance costs, or by waste reduction.

Mando looks upon each phase of this program, large or small, as an important step to increase the over-all efficiency and economy of operations. A round-up of what Mando sought to accomplish follows here and on the next two pages.

What Mando Did . . .

• **Improved product quality.** Pushbutton controls and instrumentation have been combined to provide closer control of various operations. In the new 4-story bleach plant, for example, a central instrument panel on the top floor controls the quantities of materials used in process, their chemical strengths, the time element, process temperatures, and other process conditions. Because the panel is remote from the process, it separates employees from the irritating atmosphere of chlorine. Also the panel is thus protected from corrosive gases.

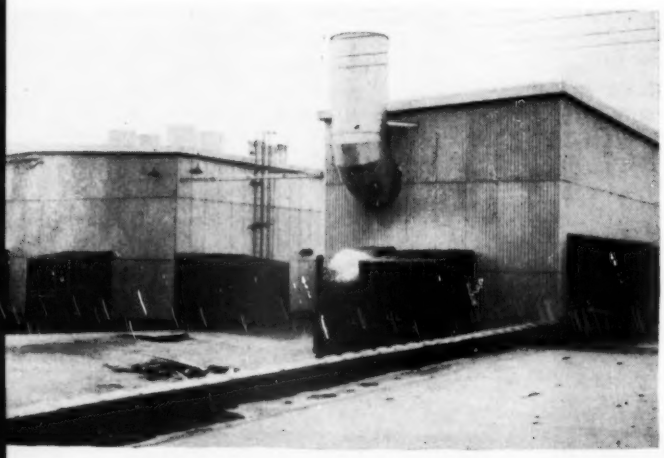
• **Provided clean water.** When Mando built its new bleachery to produce high-brightness papers, it needed color-free water. The water supply from the Rainy River, which the plant borders, ranges in color from light yellow to brown because of its fresh stream origins. Research showed that treatment by coagulation, settling, and filtration would remove this color. So Mando built a filtration plant that can deliver 15,000,000 gallons of water daily.

The raw water is pumped from the river to the filter plant, treated with chemicals, and passed into two horizontal precipitators. These are compartmentalized concrete basins 33½ feet wide, 112 feet long, and some 15 feet deep which separate out the chemical sludge. From here the water flows to five gravity-type sand filters 24 feet wide by 30 feet long by 13 feet deep, and then to a 789,000-gal. clearwell which serves the mill. In this operation raw water with a color rating of 55 ppm. comes out of the clearwell at only 2 ppm.

For further benefits from this program, turn the page

• **Maintained product quality.** Mando lined the insides of its steel stock tanks with acid-proof tile, to prevent rusting action which would impair the quality of paper turned out on the paper machines. It also enclosed a large tank farm for pulp stocks within a covered steel structure to keep the pulp clean. This also cured the problem of freezing in the winter. Now Mando gets a better-quality product because the pulp is cleaner, more uniform, and always at the same temperature for the season.

• **Prevented shutdowns.** The water pumps for pumping river water to the plant are motor driven. Any failure here would cripple the plant. So Mando has just installed two gasoline-engine pumps in the pump house as standby units. These units are completely independent of the others.



• **Improved maintenance services.** With the expansion of production facilities, new and better maintenance facilities were needed. The area was doubled—so now there's more elbow room in the pipefitting and tinsmith shops. New machine-shop equipment was purchased last year. A modern roll-grinding room was set up for precision work formerly done at another mill. It was so located that now it takes only 10 to 20 minutes to remove a roll from any of the three paper machines and place it in the grinder, an important consideration when production is at a standstill.

• **Saved fuel.** Several approaches were made to get more process steam at lower cost. A new high-pressure steam generator replaced two old and inefficient low-pressure units. This steam is used for electric power generation as well as processing. And another unit operating at 1275 psi. is now under way to effect further improvement.

• **Cut upkeep costs.** Wherever possible, Mando seeks to lengthen life of equipment by minimizing chances of corrosion. It spray-lined a new 2200-ton coal bunker with cement, to prevent the steel from rusting because of wet coal. It has used stainless steel pipes for handling pulps. A baked phenolic coating was used on plain steel pipes, process screens, and paper machine parts, which should double their life expectancy. Mando installed cathodic protection equipment in a new 200,000-gal. elevated water tank. It spray-coated a zinc lining onto the inside of four steel tanks used for storage of bleached pulp. The concrete bottoms of these tanks were lined with tile. These improvements add up to sharply reduced corrosion — and upkeep.

• **Saved heat.** Mando replaced and extended its Briner economizers over all three paper machines and four Insulite fiberboard machines. Their function is to save steam (by extracting heat from waste hot air), to preheat air for space heating in winter, and to heat water (1100 gpm.) for process and domestic uses. The waste hot air comes from the drying sections of the machines.

The economizers, located on the roof, are controlled automatically by inside and outside thermostats to maintain proper air conditions inside the plant both winter and summer. This is done by bypass mechanisms.

Fuel saving isn't the only benefit. Better air circulation and reduction of moisture in the air creates better drying conditions for the product. The control of ambient heat leads to more uniform quality. And working conditions are more satisfactory.

• **Utilized scrap.** Bark and wood refuse that was formerly thrown away is now used as fuel in a special steam boiler. This material comes from the woodroom where the pulpwood is debarked and chipped. It produces 50,000 pounds of steam per hour at 450 psi.

• **Minimized waste.** A new flat screening system recovers most of the pulp fibers—usable as filler stock in lower grades—that are found in the water coming off the paper machines. It is more effective than the rotary screens used in the past.

• **Salvaged waste.** By installing a black liquor waste (waste from Kraft pulp process) recovery unit, Mando gets a double return on the investment. This unit uses black liquor as a fuel to generate 47,000 pounds of steam per hour. It also recovers chemicals that are re-usable in the process. Now under construction is a second recovery unit, which makes it possible to use the existing unit either for standby purposes (if other unit breaks down or needs routine maintenance) or for steam generation with alternate oil burners. This in turn permits retirement of some old and inefficient boiler units.

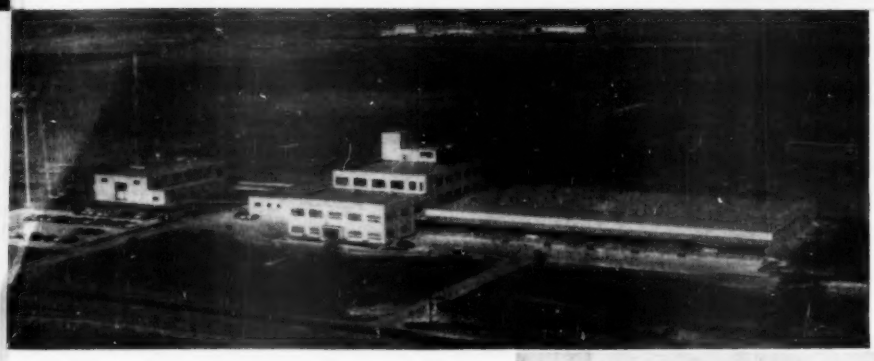
• **Improved working conditions.** Both the paper control laboratory and the technical control offices now have comfortable air conditions all year around. A new ventilation system provides for cooling or heating of air by water coils in the ducts. Rooms have individual temperature controls. The incoming air is filtered to eliminate foreign matter which might affect the tests.

• **Prevented air pollution.** By adding air cleaning equipment to keep the free air pure, Mando has not only avoided any possible nuisance to surrounding areas, but has also turned up a definite saving. A new electrostatic precipitator recovers 95% of the salt particles that formerly escaped through the stack of the Kraft pulp mill. It amounts to almost 10 tons per day, and is re-used in the process.

Fly-ash collectors on a new bark burner unit and on other steam boiler units keep the ash out of the free air.

• **Boosted worker efficiency.** In many sections of the mill, incandescent lights were replaced by fluorescent fixtures. At some of the paper-machine inspection stations, light intensities are 50 foot-candles. There's a small saving in power, too.

• **Provided plant security.** Mando also modernized its appraisal of proper plant protection. It enlarged the guard force, and improved and added to the yard-lighting system. For better fire protection it extended the sprinkler system and replaced obsolete sections. It also installed a central fire-alarm control system. As a final step, a disaster plan was worked out to meet any serious emergency.



DESOTO
PAINT & VARNISH
COMPANY'S
NEW PLANT HAS

ROOF-TOP BOILER PLANT saved $35,000 in construction cost by eliminating the need for excavation, and the expense of building a smokestack. Plant has two cooling towers (one of them is at right): for process water, and air conditioning.

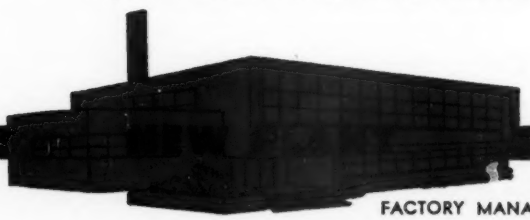
Plant Services That Are Ready

Plant services at DeSoto Paint & Varnish Company's new plant are ready for whatever tomorrow brings in the way of production. They're modern—and expandable.

NAME: DeSoto Paint & Varnish Company
LOCATION: Garland, Tex.
PRODUCT: Paints, varnishes, and resins
EMPLOYEES: 130
ARCHITECT AND ENGINEER: F. T. Tobey, Jr. & Associates, Memphis
BUILDER: F. T. Thayer, Jr. Memphis

Tank farm, an important part of an operation like this, is in a separate building. While most tank farms are outdoors, DeSoto executives felt that being able to control the temperature, and thus the viscosity, of the materials stored, was well worth the expense of enclosing the tanks. Each of the 36 tanks has its own pump and pipeline to the production area. Pumps are operated by remote control switches from the process area. An inert-gas generator supplies gas which is automatically metered into the storage tanks to blanket the material, preventing both fire and oxidation. Tanks are only half the building height, so capacity of the farm can easily be doubled.

Two cooling towers help cut the water bill, an important item in this area. Water recirculated through these towers is used for air conditioning and process cooling. Even if the cost and possible shortage of water were not a factor, towers would still be required, since the temperature of water in the mains hits 120 F. Capacity of tower in picture above is 450 gallons per minute.



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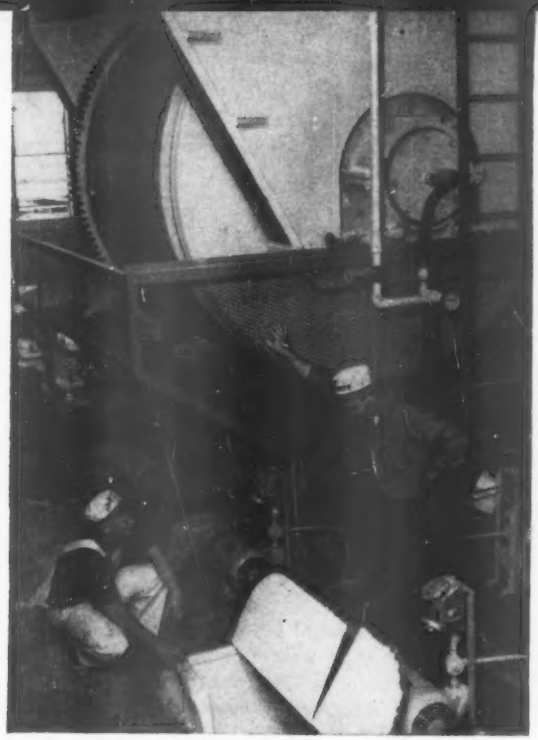
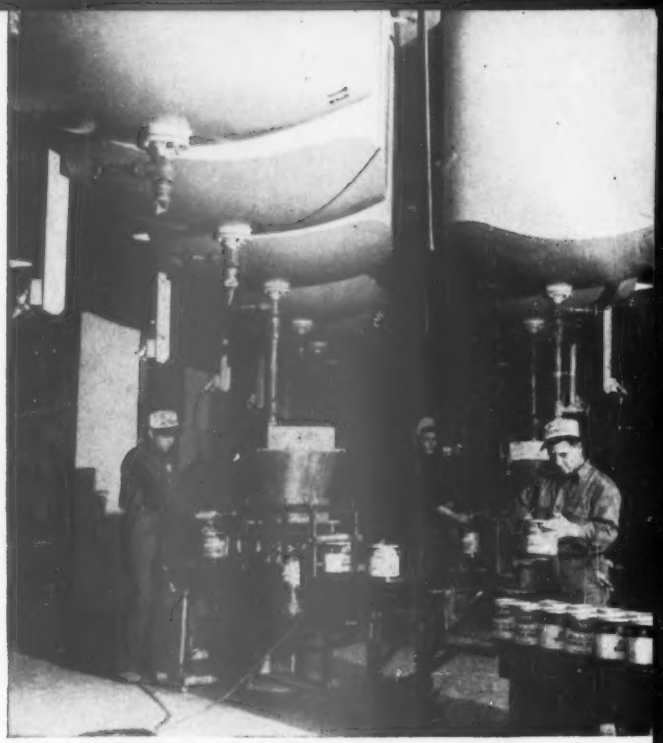


CEILING-HUNG EQUIPMENT—like this pebble mill—let plant planners put four-level, gravity-flow process on three floors. First two stages are on top and second floors, and . . .



. . . **GROUND FLOOR** houses final two stages of gravity-fed production process. Materials are stored in tanks suspended from ceiling. Then cans are filled at floor level.

Now for 195X Production

Water sprinkler system, supplied from a 100,000-gallon water tower reserved for that purpose, protects the entire plant, warehouse, office, laboratory and tank farm. System is also connected to city water mains.

Dust from mixers (generated when pigments are dumped into mixers) is collected by a roof-mounted dust collector.

Public address system is used to page people, and to pipe music to the shop.

Locker facilities are convenient. Main locker room is near time clock entrance. It has modern fixtures, tile walls, and a 5-ft. tile wainscoting for ease of maintenance.

Ready for expansion. Plant is now operating at a 2-million-gallon-a-year rate, based on an 8-hour day, 40-hour week. With a small amount of additional equipment and personnel, output can be boosted to 3-million gallons with no expansion to the building.

The beams and holes through the floors that would be necessary to install additional equipment and services are already "in." Since the floors contain a great deal of reinforcing steel, which would make it difficult to drill holes for additional electrical conduits, air lines, water lines, etc., metal sleeves were placed in the floor adjacent to each column (i.e., on 20-foot centers). If additional lines are needed in the future, it will be necessary only to knock out the plugs in these sleeves to run lines through one or more floors.

Designed for flexibility. The electrical system (a simple radial system with load centers) has feeders laid out in a regular grid throughout the shop. Switch boxes are oversize to allow for added circuits when needed. In all water lines, T's have been installed at frequent intervals to allow for tapping in wherever water service is needed.

WINDOWLESS CONSTRUCTION except for office area helps make air conditioning job easier for new Rockwell plant. Location at Sulphur Springs, Tex.

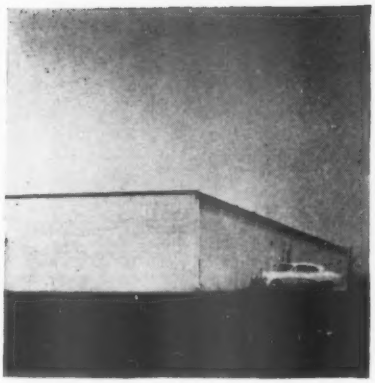
Air-Conditioned for Comfort

Sure this plant is in the South. But it can get mighty uncomfortable on many days anywhere in the country. And listen to what Rockwell executives say about the air conditioning in their plant:

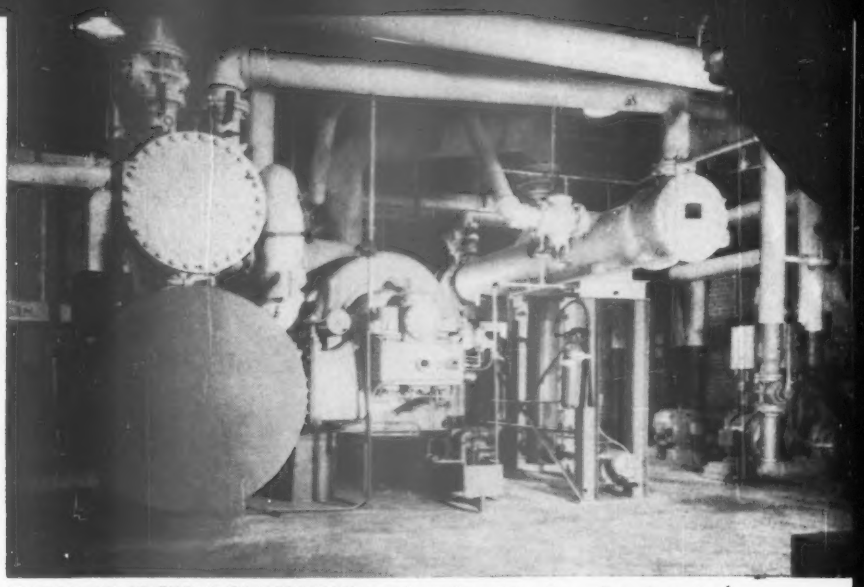
"It's for worker comfort only, and is not required by our processing. We felt that

NAME: Rockwell Manufacturing Company
LOCATION Sulphur Springs, Tex.
PRODUCT: Valves
EMPLOYEES: 150
ARCHITECT AND ENGINEER: Raymond F. Smith, Dallas
BUILDER: Wood Fabricators, Inc., Meridian, Miss.

FLUORESCENT LIGHTING in toolroom, as in all other factory areas, with individual workplace lighting for precision work. Interior walls (except in warehouse) are of glazed tile, for light reflectivity and ease of maintenance. Floors throughout shop are 6½-in. reinforced concrete on 4 inches of gravel. Floor surface is impregnated with iron filings for wear resistance. Floor is strong enough to support any load in plant.



puts plant near its two principal markets, petroleum and gas fie.ds.



450-TON CENTRIFUGAL COMPRESSOR furnishes refrigeration for cooling plant. It is driven by a steam turbine. Steam is supplied by two 130-hp. gas-fired boilers. (Boilers also supply process steam.) Freon is the refrigerant. Temperature of cooling water is held at about 45F. System is combination heating-cooling. In winter hot water is circulated through air handling units, each 5000-cfm. capacity. In summer chilled water, after passing through handling units, passes through a cooling tower, so that almost 100% of the water is recovered. Scarcity of water for cooling dictated this type of system—it required only 7½ gallons per hour to make-up water.

the cost ($2.25 per square foot) would be justified by the greater productivity obtained by working under better atmospheric conditions."

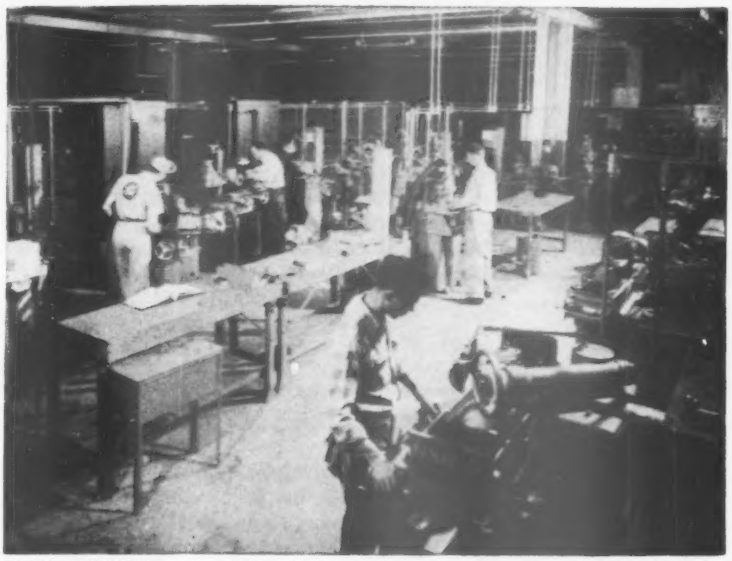
Temperature in both shop and offices is held at about 76 degrees.

Plenty of room · The new Rockwell plant has 116,000 square feet of floor area. It's located on a 60-acre site. Expansion will be in the form of separate new buildings, rather than extension of the existing building. (That meant there was no need for oversize services in the present building.)

Ease of maintenance · Provisions for convenient housekeeping are easy to spot. Exterior walls are buff tile; interior, glazed tile. Service tunnel makes plant utilities easily accessible. All equipment in washrooms, toilet rooms, and locker rooms is wall-hung.

Employee facilities · Adequate for 250 people, which leaves plenty of room for an increase in the 150-man work force. The plant has no cafeteria, since an hour is taken for lunch and most workers go home.

Total cost of the plant was about $10 per square foot.



PLANT SERVICES are distributed along column lines wherever needed. Machining areas are completely covered by bus duct, so that transfer of machines from one location to another causes no power problems. Services are supplied to column lines from a utility tunnel which crosses building at about mid-point. This minimizes cable and pipeline runs, but makes services re.dily accessible for tapping or maintenance.

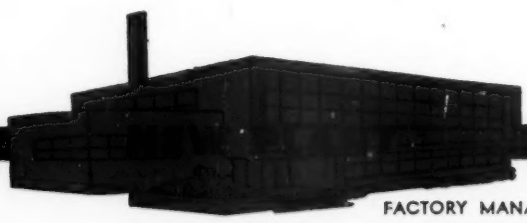
WORKING WITH SCALE MODEL, production and plant engineering supervisors studied the effects of production equipment layout on plant services. Their aim: to keep the complicated piping and other service lines required by the heat treating process (Lindberg's "product" is heat treating service) out of production's way. The result: a plant that is . . .

Designed With the

NAME: Lindberg Steel Treating Company
LOCATION: Melrose Park, Ill.
PRODUCT: Heat treating service for other manufacturers
EMPLOYEES: 400
ARCHITECT: John S. Cromelin, Chicago
ENGINEER: F. J. Heckel, Chicago
BUILDER: Clearing Industrial District, Chicago

Careful planning of plant services played an important part in the design of Lindberg's new plant. Experience with the old plant had taught company executives that, to meet their prime objective of high production and top quality, they needed plant services that were dependable. They must be easy to maintain, easy on upkeep and repair costs, and expandable (the 100,000-sq. ft. plant can be expanded to three times its present size on the 6½-acre site).

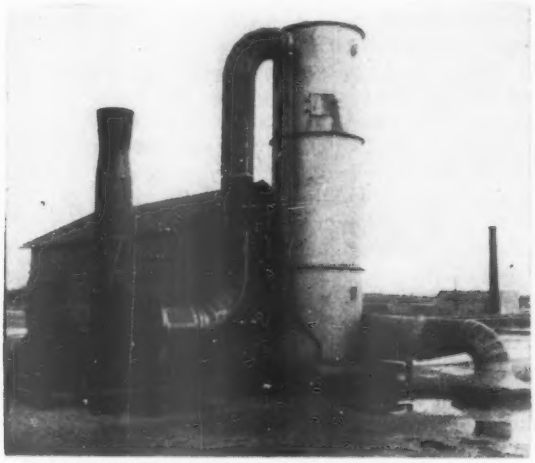
And an important part of this planning of plant services was,



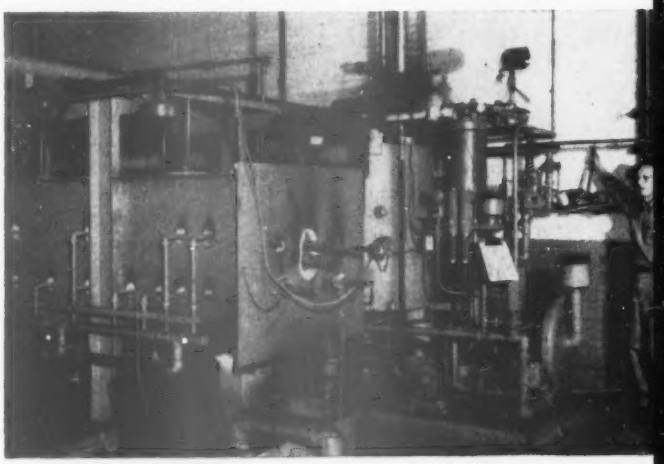
A SIGNIFICANT TO GUIDE YOUR

IN THIS CENTRALIZED PUMP HOUSE, maintenance men can keep an eye on—and conveniently maintain—pumps, evaporative coolers, air compressors, and liquid storage tanks.

PIPELINES WERE EMBEDDED in concrete floor wherever possible to keep floor clear. Pipes have special wrapping and coating, are expected to last 50 years.



AIR HANDLING EQUIPMENT ON ROOF saved factory space, cut down interior noise level. Above are exhaust fans, air intake, and air washing facilities.



PROTECTION FROM FIRE in quench tanks is provided by a centralized CO_2 supply. The 2-ton central tank is triggered by pulling levers located near each hazardous workplace.

Best in Plant Services

strangely enough, working plant service layout against process equipment layout. If the process equipment were laid out with no thought to services, the result would have been a complicated maze of piping and other service lines that could slow production, be costly to install and maintain. Instead, process equipment was laid out with services very much in mind. Examples follow.

• **Piping for cooling fluids.** To reduce the amount of piping required, quench tanks were grouped in each area.

• **Exhaust system.** Grouping of the salt baths simplified the run of exhaust ductwork, avoided the multiplied costs required by a divided layout.

• **Substations.** Three electrical substations were spotted after the load centers were figured out

from final equipment layout. They were located out of the way on overhead platforms, and provided with forced-air circulation for cooling.

• **Storage tanks.** Based on plans for expansion, Lindberg located its quench fluid storage outside the present plant, but centrally located as to the final, future layout.

HOW LINDBERG DESIGNED LOW-COST PLANT SERVICES

After the careful planning of equipment layout to get the best in over-all layout of services, Lindberg chose and installed each plant service with a further view to keeping upkeep and repair costs low. Here are the highlights:

Lighting · Reflector-type R - 5 2 incandescent bulbs (500 watt) for general overhead lighting eliminate the job of periodic cleaning of reflectors. Low dirt factor gives sustained lighting levels.

Pipelines · Capacities of all pipelines were sized for ultimate needs. This will minimize need for parallel or supplementary runs later on. Lines below floor level are buried in the floor. All overhead pipelines are color coded to ASA standards.

Pump house · All quenching liquids are returned from shop tanks to their respective underground storage tanks in the pump house by gravity through underground pipelines. Five 10,000-gal. tanks are inside the pump house and one outside. In the pump house, sets of centrifugal pumps pick up the fluid and send it to the shop quench tanks. Flow is controlled by color-coded valves at tanks.

Each quench fluid flows constantly through an evaporative cooler (also in the pump house), which automatically starts water spray action when the fluid reaches a control point. There are four coolers, two of which have split sections to accommodate the lower Btu demands of four of the liquids. This installation can handle a total cooling load of 6-million Btu's per hour.

Three small centrifugal pumps, each of 250-gpm. capacity, are used at quench tanks, instead of one large pump. Thus for small amounts of liquid only one smaller pump need be used. Two pumps can handle most of the requirements. The third pump is a standby in case of breakdown.

Fire extinguishing systems · Each quench tank is protected by properly placed nozzles of a carbon dioxide system. All nozzles are connected to CO_2 mains that run throughout the shop. These mains originate from a storage tank of 2-ton capacity 100 feet from one end of the plant.

Discharge of CO_2 at any tank is controlled by a manually operated quick-opening valve located nearby. When an operator throws the valve lever to the open position, an electrical impulse simultaneously opens a main valve at the storage tank and fills the piping system with CO_2. Gas will flow for one minute, then stop, so as not to exhaust the supply needlessly. Usually one shot will put out the blaze. If more gas is needed, operator can repeat the valve sequence as many times as necessary.

To secure CO_2 protection for the whole plant, Lindberg has installed four 100-ft. hose reels. When an operator removes the hose-reel nozzle from its wall mounting, CO_2 gas automatically enters the mains and will flow out at the hose end until he releases the valve lever.

Air handling · Blower room on the roof contains three blowers to supply low-pressure air to furnaces. The air is filtered to save on maintenance of gas mixers, valves, and burners. One unit is standby, makes possible the routine inspection and upkeep of the other two units.

Alongside the blower room is the wet wash process for air exhaust hoods over the various brine tanks. The fumes are rendered harmless before exhaustion to the air. Another roof installation draws off natural salt fumes from the salt pots and projects them at high velocity overhead through a short chimney for greater diffusion.

The shop itself needs no power ventilation. It has 12 large doors—about 13 x 20 feet—and many ventilating openings in the steel sash forming the upper half of the sidewalls.

Safety and standby features · Wherever possible, Lindberg designed its service equipment for uninterrupted service. For example:

• **Compressors.** A 100-hp. compressor in pump house furnishes clean, cooled air at 100 psi. to all parts of the plant. A second standby compressor is alongside.

• **Furnaces.** Safety valves shut off gas supply should the electrical power fail, thus prevent blow-ups. On furnaces requiring controlled atmosphere, automatic controls prevent explosions. Dual-fired setup (gas-oil) protects against fuel shortage.

• **Atmosphere generators.** By connecting seven of these in parallel, with proper means of adjustment for slight pressure differences, Lindberg assures a steady supply of endothermic gas to all furnaces should one unit have to be repaired.

Other service features · Piping of gas is valved at individual points of usage so meters can be easily installed to check consumption.

• An hour-meter is used to check electrical consumption by calculating power used from total reading. Office area has zone-controlled heating and air conditioning.

• Employee facilities—locker rooms, restrooms, and cafeteria—are located on the second floor over the office. Entrance from the shop is by a shop area stairway, avoiding heavy traffic through the office.

this NEW 500-PAGE CATALOG

covers every item in the complete Lunkenheimer line

The new Lunkenheimer catalog is the most complete valve reference work in print! It covers all the thousands of items in the Lunkenheimer line —using non-technical language and easy-to-understand sectional and exterior illustrations. For the engineer, there are more than 100 pages of reference data, including code requirements and specifications. And the handy four-way index and three-color Guide section make this catalog as easy to use as a telephone book. In the Guide, valve illustrations are grouped by pressure classes for easy comparison — each referenced to the page number in the catalog where complete details can be found. It's actually two catalogs in one!

LUNKENHEIMER

QUALITY

BRONZE • IRON • STEEL

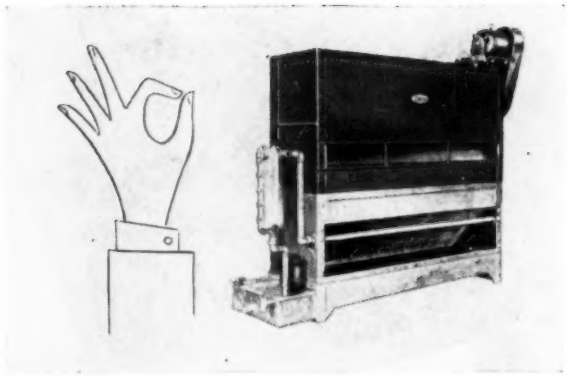
THE NEW LUNKENHEIMER CATALOG is so important that it is being distributed personally. When your copy is delivered, be sure to go over it briefly with the representative who brings it to you. He can show you how to take full advantage of all the features which save you time and trouble in ordering. The Lunkenheimer Company, Box 360L, Cincinnati 14, Ohio.

LUNKENHEIMER®

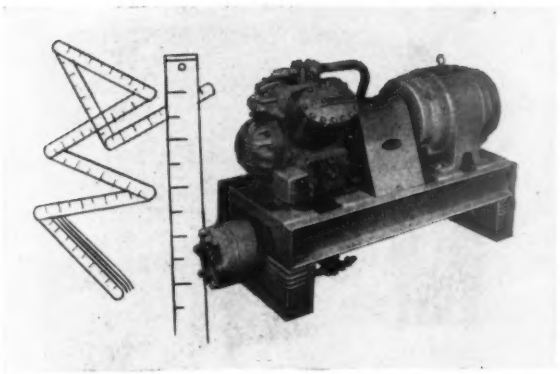
THE ONE *Great* NAME IN VALVES

PLANNING TO AIR CONDITION?

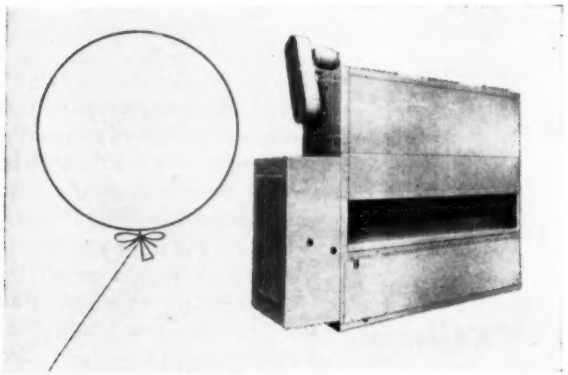
There's a Carrier Weathermaker to fit your plans—and your plant!



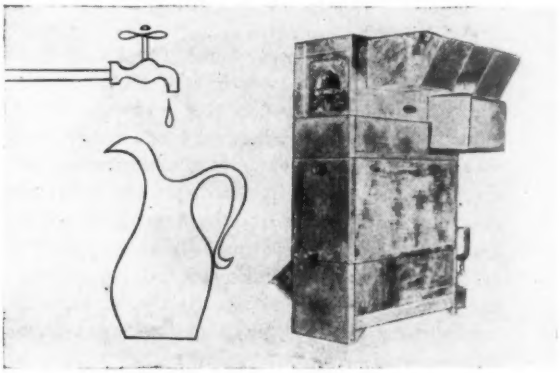
J-U-S-T RIGHT! If you need exact temperature and humidity control, check Carrier's versatile Industrial Weathermakers*. They're used, for example, to air condition IBM equipment rooms, printing plants, mills, shops, laboratories everywhere.



COMPRESSORS IN 18 SIZES. Want a compressor that will fit a job *exactly* while operating at maximum efficiency? You can be sure that one of the adaptable Carrier Reciprocating Compressors is right for the job. Capacities from 3 to 200 hp.



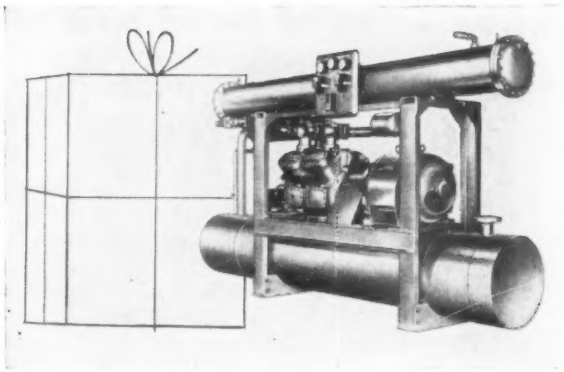
FLEXIBLE PACKAGE. Carrier's 20-hp packaged Weathermaker has the performance features of a built-up system, yet it's a compact, self-contained unit. Ideal for smaller plants. Humidifier, heating coil and filters may be added.



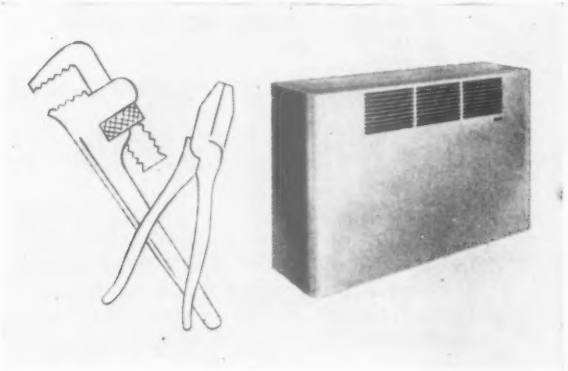
RUGGED WATER-SAVER. If your water rates are high or water use is restricted, you'll want to check Carrier's Evaporative Condensers. They take the place of water-cooled condensers and cooling towers, save both water, power. Locate indoors or out.

* Reg. U. S. Pat. Off.

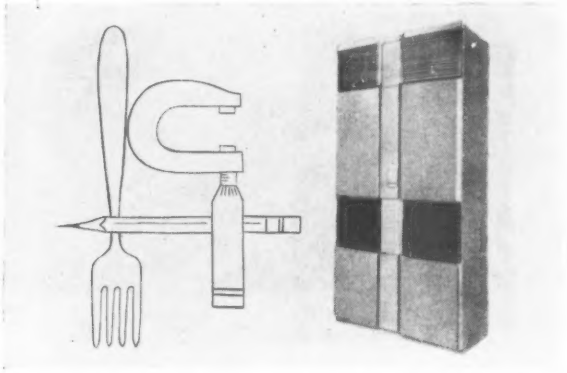
1. *Carrier air conditioning serves more industries more ways than any other make.*
2. *Carrier people founded the air conditioning industry more than 50 years ago.*
3. *This experience is worth money to you when you come to air condition your plant, whether it's new or old, large or small, all or part of a building.*
4. *Why not talk it over with your Carrier dealer? You'll find him listed in the Classified Telephone Directory. Or write to Carrier Corporation, Syracuse, New York.*



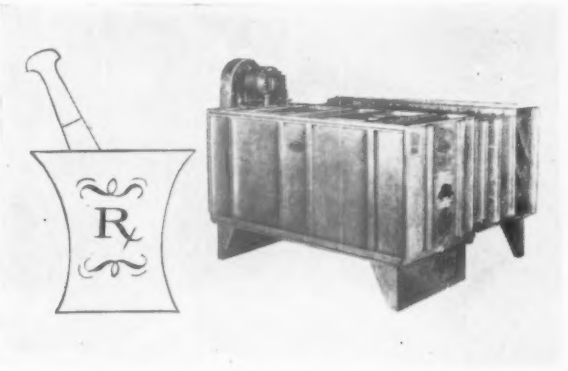
NEAT AND COMPLETE. Carrier's compact, completely assembled water-cooling systems cut installation problems to the bone. Can be used for all kinds of comfort and process applications. Now available in three sizes: from 75 to 125 hp.



COMFORT WITHOUT DUCTS. Existing office space is easy to air condition with Carrier Room Weathermakers. Fan-coil units fit under the window, require only simple pipe and electrical connections. Can be used for winter heating, too.

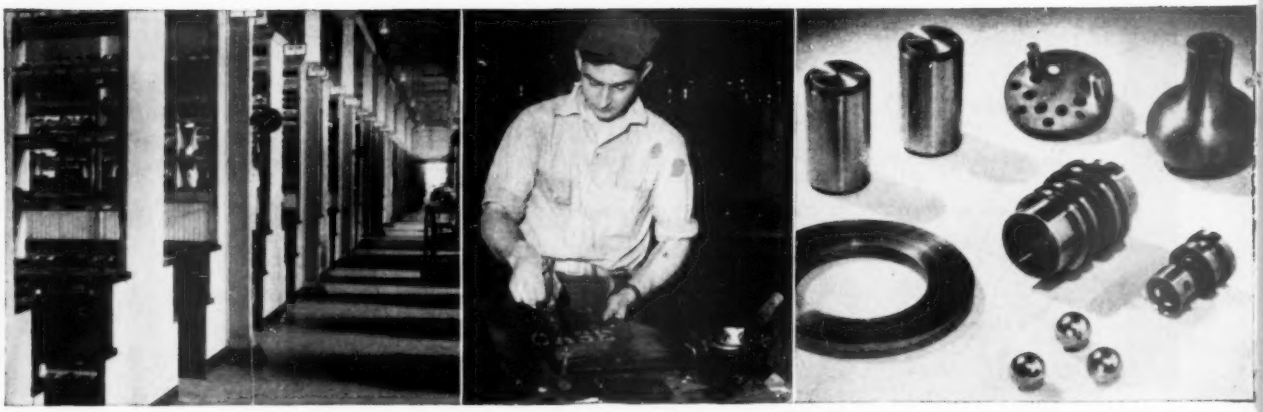


DEPARTMENT BY DEPARTMENT, you can air condition your entire plant with Carrier's 2-15 hp packaged Weathermakers. Widely used in offices, inspection rooms, precision tool sections, plant cafeterias. Provide extreme flexibility of installation.



CLIMATE BY PRESCRIPTION. How will you have your air? Cooled? Dehumidified? Heated? Humidified? Filtered? A Carrier fan-coil type System Weathermaker can be made up to fit your exact requirements. Economical, efficient, easy to install.

Carrier AIR CONDITIONING • REFRIGERATION • INDUSTRIAL HEATING



PROTECT YOUR PRODUCTS

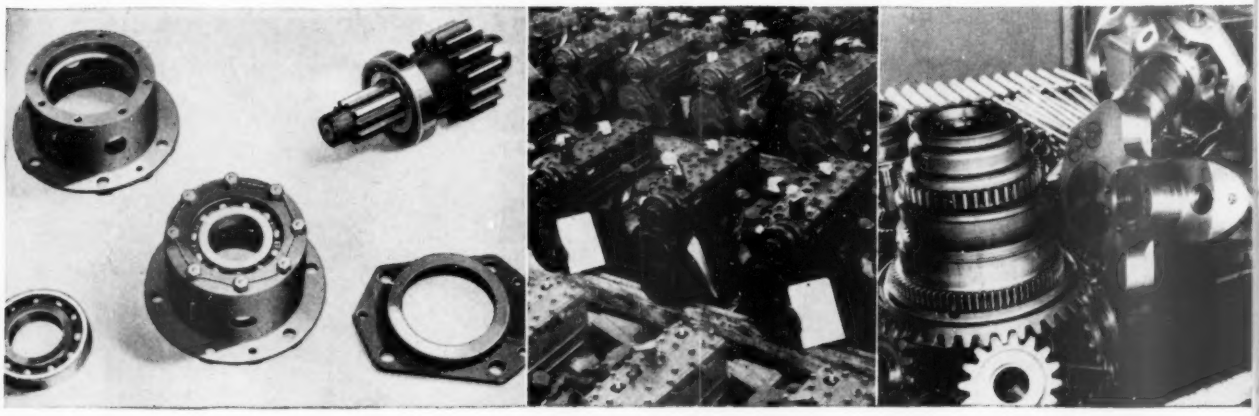
in production . . . storage . . . shipment, with

NO-OX-ID RUST PREVENTIVES

Every step of the way, industry relies on Dearborn NO-OX-ID protective coatings to control corrosion.

On production lines a NO-OX-ID shop coat seals out moisture. During long or short-term storage—indoors or outdoors—a tough NO-OX-ID film stops corrosion. NO-OX-ID also protects metal surfaces against the effects of temperature and humidity variations. When you rely on NO-OX-ID for protection, rejects are minimized and your products remain free from corrosion.

Look into industrial NO-OX-ID and the money-saving protection it will give to your metal products. A good way to do this is by talking with your Dearborn engineer. He has profitable suggestions.



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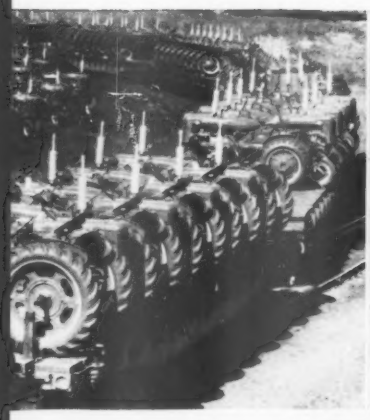
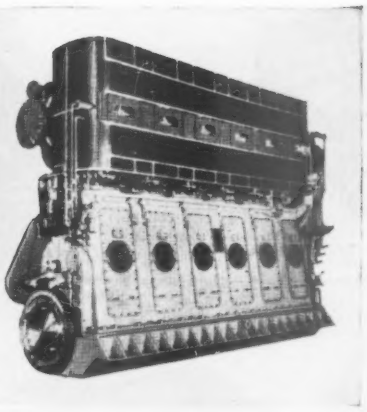
TRADE MARK

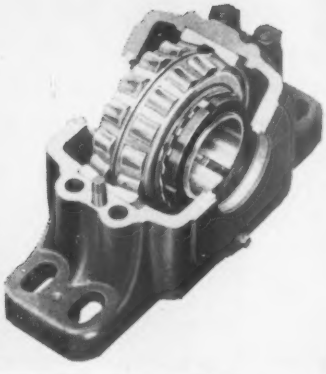
DEARBORN CHEMICAL COMPANY
MERCHANDISE MART PLAZA
CHICAGO 54, ILLINOIS

THE ORIGINAL RUST PREVENTIVE

NO-OX-ID







NO-OX-ID

is easy to apply!

There is a NO-OX-ID application method that will fit into your plant operations and type of product. NO-OX-ID can be manually applied by brush, swab or basket immersion. On mass production lines the conveyor dip method assures fast, effective, economical protection. Cold-spray gun application is another approved method used in many plants.

know your *Dearborn* engineer

Dearborn has specialized in the control of corrosion and conditioning of water since 1887. This broad experience in rust prevention and water treatment—plus Dearborn's extensive research and laboratory facilities—are at your service—at no obligation. You'll find it will pay to consult with your Dearborn Engineer.

write for bulletin No. 3076

This informative bulletin describes various industrial NO-OX-ID protective coatings, their characteristics, application methods and use recommendations. Your copy supplied promptly upon request.

Q
WSB3B
3-Gallon,
Bottle Cooler
WS5B
5-Gallon,
Static Air Cooled
WS8B
8-Gallon,
Static Air Cooled
WA13B
13-Gallon,
Air Cooled
WA17B
17-Gallon,
Air Cooled
WW14B
14-Gallon,
Water Cooled
WW20B
20-Gallon,
Water Cooled

Do Westinghouse Water Coolers give you more for your money than any other make?

A

Yes... and these exclusive features prove why.

You don't have to search far to learn why more managements choose Westinghouse Water Coolers than any other make. It's just this: With Westinghouse you get more for your money than any other make offers : : : everything included in normal specifications plus a number of exclusive features for double assurance of maximum efficiency with minimum maintenance.

For instance, the new *Dual Electric Control* provides BOTH finger-tip and toe-tip operation at *no extra cost* : : : and utilizes a solenoid-type water valve that cuts maintenance cost. This valve permits a completely *sealed-in* water system. There is *no* valve stem packing to leak, *no* moving parts to wear out.

Then take a look at the exclusive, patented *Pre-Cooler* and *Super Sub-Cooler*. These substantially increase cooling capacity : : : use cold waste water to pre-cool the incoming water and the refrigerant. The end result is that you get more cold water capacity per dollar of electrical power.

NEW... WESTINGHOUSE PAY-WAY COMPUTER

The Westinghouse Pay-Way Plan is a simple formula based on time and motion studies which prove that proper placement of water coolers, in relation to work areas, can save you many payroll dollars every year. With the Pay-Way Computer, as illustrated, these savings can be quickly calculated. For complete details and a free Pay-Way survey, check the yellow pages of your telephone directory for your nearest Westinghouse Water Cooler Distributor. Or drop us a line.

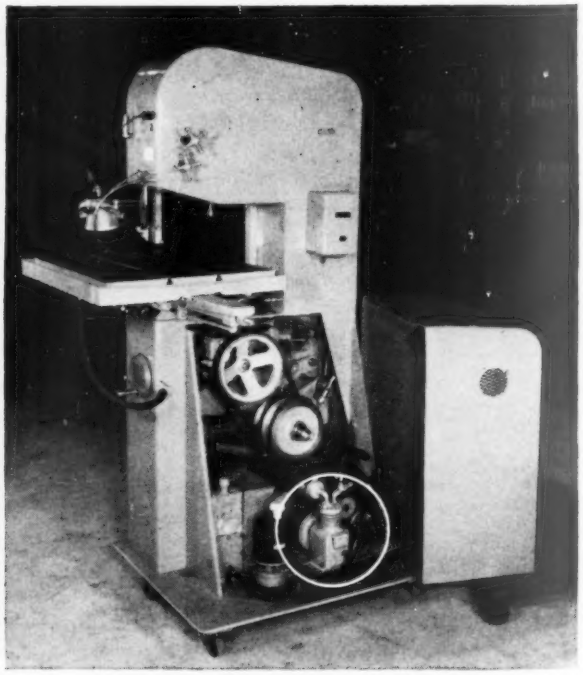
WESTINGHOUSE ELECTRIC CORPORATION
Electric Appliance Division • Springfield 2, Mass.

See TV's Top Dramatic Show... WESTINGHOUSE STUDIO ONE... Every Week

YOU CAN BE SURE... IF IT'S Westinghouse

DeVilbiss helps you get the most from the spray method

1. FINER FINISHES — *The DoAll Company relies on DeVilbiss spray equipment for durable, gleaming finishes on its band machines, surface grinders.*



2. COMPONENT PARTS — *DeVilbiss Air Compressors supply pressure that forces a jet of air and coolant against the saw blades in DoAll Band Machines.*

DeVILBISS HELPS DoALL TWO WAYS!

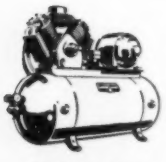
The DoAll Company, Des Plaines, Ill., produces saw-band machines capable of cutting every known material. It also makes surface-grinding machines so precise they can erase a pencil mark on a slab of steel without marring the surface!

DoAll uses DeVilbiss equipment two ways: they use DeVilbiss Spray Guns and Spray Booths to paint their world-famous tools, and they use DeVilbiss Air Compressors as a component in their band machines.

Says DoAll's Clinton Rosene, "We give our customers quality throughout the machine – that's why we selected DeVilbiss equipment. DeVilbiss Air Compressors give dependable service with little or no attention. Our DeVilbiss spray-painting equipment assures attractive, long-lasting finishes."

DeVilbiss can help you improve your product with finer finishes, and with quality components such as hose, hose connections, air-line regulators and filters. Get complete facts, today, from your nearest DeVilbiss jobber or branch office; or write us direct for free literature.

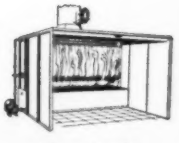
THE DEVILBISS COMPANY, Toledo, Ohio — Santa Clara, Calif. • Barrie, Ontario • London, England



Air Compressors

Hose and Connections

Spray Guns



Spray Booths

FOR BETTER SERVICE, BUY
DEVILBISS

BRANCH OFFICES AND DISTRIBUTORS IN PRINCIPAL CITIES THROUGHOUT THE UNITED STATES, CANADA AND THE WORLD

NEW FREE

CATALOGS

PLANT SERVICES

OTHER SECTIONS:
Production ..... *Page 176*
Buildings & Grounds *B-28*
Electrical Distribution *C-36*

122 • Vacuum Cleaners. Gives 132 unusual uses for maker's vacuum cleaners in this 20-page booklet (No. 144). Case studies and illustrations for production and maintenance applications. *Spencer Turbine Co.*

123 • Absorbent Compound. Form No. A 261 tells how to use maker's floor absorbent for absorbing oil, grease, and other liquids. Suggests applications, tells how to use. *Eagle-Picher Sales Co.*

124 • Cleaning Materials. This 24-page booklet describes maker's line of cleaning materials, deodorants, and insecticides. How and when to use. Suggests solutions to many difficult plant cleaning problems. *C. B. Dolge Co.*

125 • Blowers and Exhausters. Here are two detailed catalogs (Nos. 22-23-B and 120-B) on rotary positive blowers and centrifugal blowers and exhausters. Specifications and application data are included in each. *Roots-Connersville Blower.*

126 • Vacuum Cleaning. In this 12-page catalog (No. A-939) you get information on how maker's stationary vacuum cleaning system works. Lists advantages, tells how to design a system for your own plant. *U. S. Hoffman Machinery Corp.*

127 • Blowers and Exhausters. Here's a catalog (No. A-650) on maker's centrifugal blowers and exhausters. Lists typical applications and illustrates. Gives design and performance features. 12 pages. *U. S. Hoffman Machinery Corp.*

128 • Rust Preventives. A 64-page catalog describes maker's rust preventives. Covers oil, grease, solvent cutback, and drying types. Information on selection and surface preparation. Catalog No. 3076. *Dearborn Chemical Co.*

129 • Floor Treatment. Here's a 16-page catalog plus several data sheets on maker's waxes, sealers, floor machines, and other cleaning materials and equipment. You learn where to use each. *Continental Car-Na-Var Corp.*

130 • Floor Maintenance. This 16-page file folder tells you about floor cleaning machines and floor cleansers for effective cleaning of any kind of dirt from any type of floor. Specs and features for each product in maker's line. *Finnell System, Inc.*

131 • Vacuum Cleaner. Two folders illustrate maker's mobile vacuum cleaner and mechanical sweeper. Describe how they work, where to use them. Tell how many square feet each will clean per hour. *Handling Devices Co., Inc.*

132 • Central Vacuum Cleaning System. You'll find out how this vacuum cleaning system works, what materials it handles, how it's used, how to select one for your plant from this 20-page bulletin D-50. Photographs. *Billmyre Blower Div.*

133 • Heavy-Duty Paints. In this 16-page catalog (No. 741) you'll find applications, color chips, specifications, and installation

To get these catalogs, circle item numbers on the Reader Service card next to back cover.

Low cost air

How much does your compressed air cost?

Probably more than you think. The biggest cost in compressed air isn't the price of the compressor; it's the operating cost: the power needed to produce each cubic foot of air, the amount of service and repairs needed. That's why it will pay you to replace your old or inefficient compressor with a DeVilbiss Air Compressor. You'll save on power, upkeep and depreciation. *DeVilbiss Air Compressors deliver more air for the money.*

For a complete analysis of your compressed air needs, contact your local DeVilbiss jobber.

DeVilbiss has an Air Compressor to fit your needs, from ½ to 15 hp., single or two stage, Upright or V Type.

THE DEVILBISS COMPANY
Toledo, Ohio

Barrie, Ontario • London, England
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BRANCH OFFICES IN PRINCIPAL CITIES

FOR BETTER SERVICE, BUY
DEVILBISS

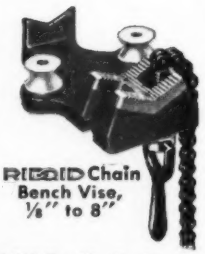
For Easiest Pipe Work ...it's the New 20 RIDGID

8 sizes for pipe from ⅛" to 6"

More utility for your money in RIDGID Bench Vises

• No wonder this bench yoke vise is popular everywhere! You can make the yoke open for either right or left hand. It has an integral pipe rest for easier cutting or threading . . . built-in pipe bender . . . strong special malleable yoke and base . . . LonGrip jaws of top quality tool-steel. You simply can't beat it for efficient easy operation that lasts for years! Buy it at your Supply House.

Same work-saver features in RIDGID post, kit and stand yoke vises and bench, post and stand chain vises.



RIDGID Chain Bench Vise, ⅛" to 8"

THE RIDGE TOOL COMPANY • ELYRIA, OHIO, U. S. A.

RIDGID
Work-Saver Pipe Tools

photos for a complete line of paint products. Gives recommended painting practice. *Valdura Div.*

134 • Lamp Guards. Folder describes inexpensive slip-on guard to prevent any type of fluorescent lamps from falling from sockets despite vibration. Other features, too, are illustrated in this literature. *Gets-A-Lite Co.*

135 • Scaffolding. How to cut costs on off-the-ground maintenance is subject of this 8-pager. Tells how to pick the right equipment for painting, electrical, plant repair, and other special jobs. *Patent Scaffolding Co.*

136 • Lighting Fixtures. This 36-page catalog tells you about complete line of fluorescent lamp luminaires. Specifications, dimensions, accessories are listed. Illustrations, light distribution curves included. *The Miller Co.*

137 • Lamp Maintenance. Here's a 12-page booklet that gives you the why's and how's of group replacement of fluorescent lamps. Shows you how to save money, tells you how to set up program in your plant. *Sylvania Electric Products, Inc*

138 • Ceiling Lighting. An 8-page catalog (No. 54-5) gives you useful information on maker's lighting systems and units. Shows how they're installed. Illustrates how to compute illumination levels. *F. W. Wakefield Brass Co.*

139 • Floor Cleaning. "A manual on sweeping and mopping floors" is a 20-page practical guide to more efficient floor maintenance. "How to remove stains from floors' is a companion 8-page how-to booklet. *Huntington Laboratories, Inc.*

Turn the page

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how to provide
PROTECTION · *PLUS*

for enclosed
gear drives . . .

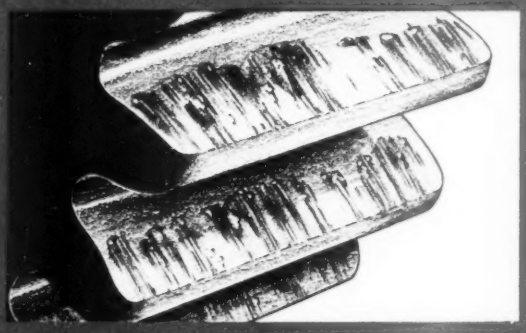
SWITCH TO GULF E.P. LUBRICANTS

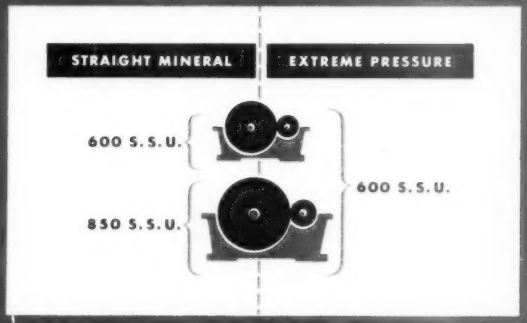
. . . and save maintenance dollars!

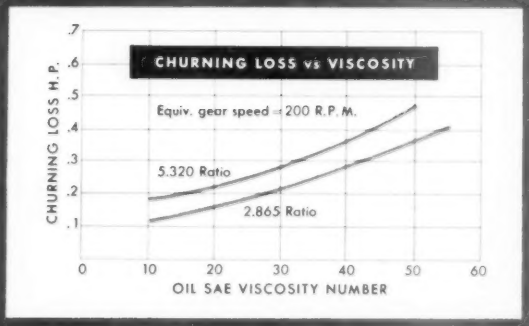
Gulf E. P. Lubricants combine all the properties that count in an extreme pressure lubricant: high film strength, excellent rust preventive properties, good water-separating characteristics, good stability, and they are noncorrosive, nonfoaming. Their use insures longer gear and bearing life and lower maintenance costs for gear drives under a wide range of operating conditions.

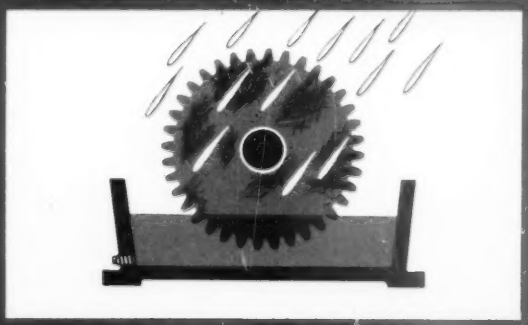
Gulf E. P. Lubricants are available in the proper viscosity for every gear requirement ranging from 55 to 1000 SUV at 210 deg. F. For specific recommendations for your equipment, call in a Gulf Sales Engineer today. Write, wire, or phone your nearest Gulf office or send the coupon on the last page.

GULF INDUSTRIAL LUBRICATION









Practical advantages of Gulf E. P. Lubricants:

More effective protection against tooth scoring and welding

Gulf E. P. Lubricants are specially compounded to provide extra film strength and to prevent metal-to-metal contact under most conditions of overload and shock load. That's why, when you use Gulf E. P. Lubricants, you can usually avoid tooth damage like that shown at the left and have an extra margin of protection when production demands approach or exceed the rated capacity of the equipment.

Fewer lubricant grades needed—lubricant storage and handling simplified

Because Gulf E. P. Lubricants have superior film strength, it is often feasible to use a lower viscosity grade than would be possible with a straight mineral oil. This is a practical advantage for plants operating several different types of gear drives. If, as pictured at the left, two straight mineral oils of different viscosity are specified, one grade of Gulf E. P. Lubricant may well do the job of both. Thus lubricant storage and handling is simplified, and there is less chance for confusion in the oil house.

Reduced power loss caused by churning in splash-lubricated units—lower power costs

There is another advantage in using a lower viscosity oil in splash-lubricated units where power loss due to churning is appreciable. Since this loss is almost directly related to oil viscosity, the use of lighter Gulf E. P. Lubricants often means reduced heat generation and lower power costs.

The chart at the left shows the effect of viscosity on the churning loss in horsepower of a typical gear unit.

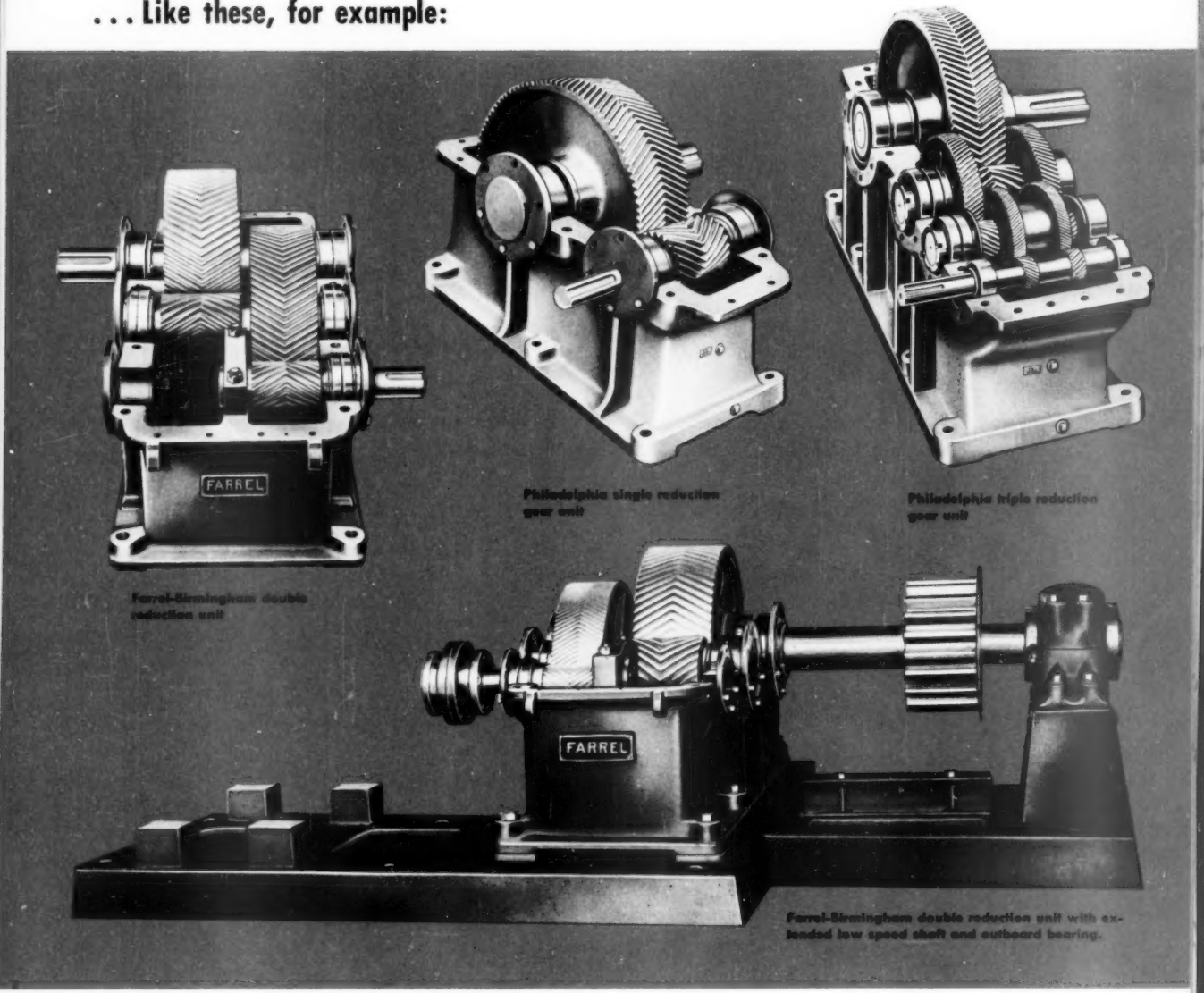
Excellent protection against rust

The ability to protect polished gear teeth and antifriction bearings against rust is an important property of a gear lubricant, and is essential in a lubricant for units which are occasionally idle.

Gulf E. P. Lubricants have highly effective rust preventive properties—insure against excessive wear and enlarged tolerances which might result from the presence of abrasive rust particles.

Gulf E. P. Lubricants are ideal for all types of gear drives

. . . Like these, for example:



Farrel-Birmingham double reduction unit

Philadelphia single reduction gear unit

Philadelphia triple reduction gear unit

Farrel-Birmingham double reduction unit with extended low speed shaft and outboard bearing.

GULF OIL CORPORATION · GULF REFINING COMPANY
1822 Gulf Building, Pittsburgh 30, Pa.

Gentlemen:

I would like further information on Gulf E.P. Lubricants:

- ☐ Please have a Gulf Sales Engineer call.
- ☐ Please send me a copy of your pamphlet "Gulf E.P. Lubricants for Reduction Gear Drives."
- ☐ Please arrange to show a group in our plant the new Gulf Color Slide Film, "Gears and Their Lubrication."

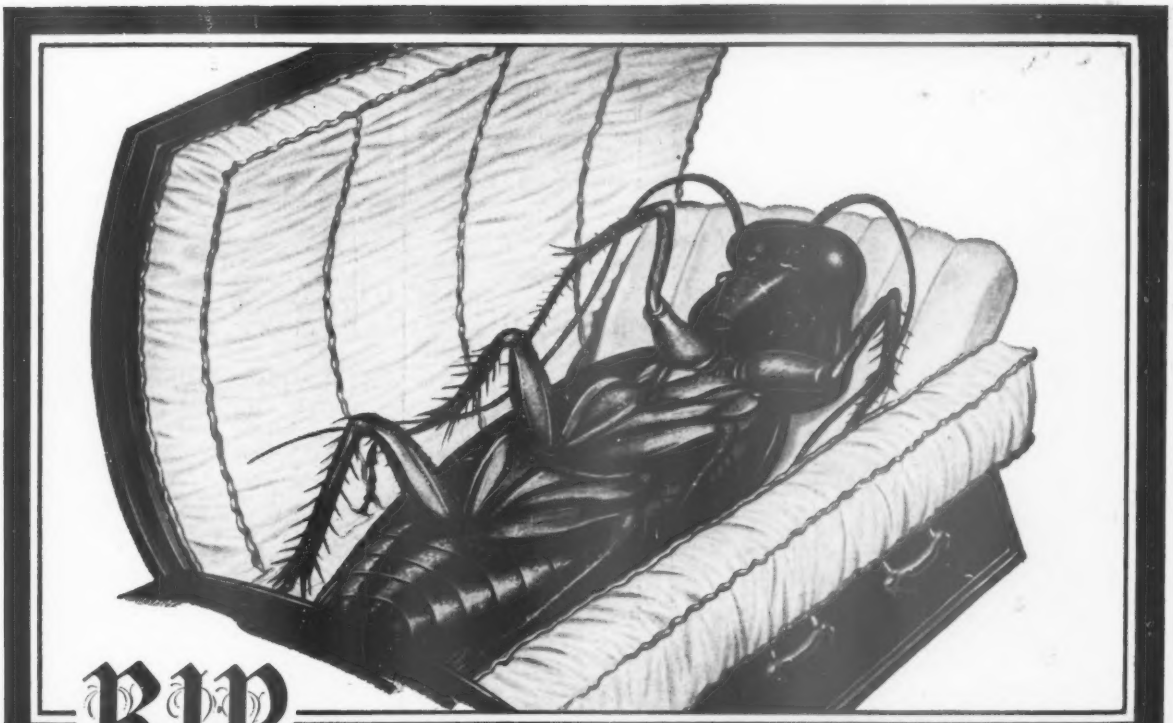
Name_____

Company_____

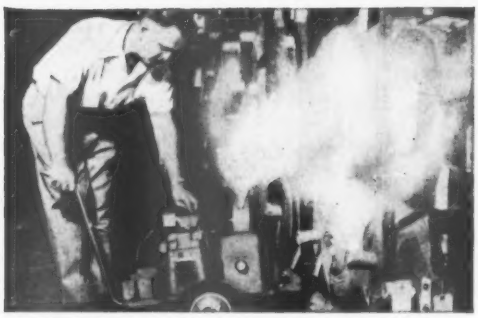
Title_____

Address_____

GULF INDUSTRIAL LUBRICATION



control insects with VAPOSECTOR!



West Atomizing Equipment (portable or permanent) has exclusive suction spray nozzles that produce a "dry fog" with uniformly sized 8-micron VAPOSECTOR droplets. These nozzles use less insecticide, cover a wider area, produce a greater kill.

High-potency VAPOSECTOR is formulated for the realist who has an insect problem and wants to get rid of it — *fast!*

VAPOSECTOR is many times more concentrated than the standard grade AA spray — and over four times as economical in use. There's no danger of contamination or odor when used according to directions. It is noncorrosive and will not injure metals, finished surfaces or fabrics, when used as directed.

VAPOSECTOR controls insects by "double penetration." When used with West atomizing equipment, it becomes a "dry fog" that reaches and penetrates hiding places, and then penetrates the insect's outer covering for a permanent kill. Insects have no place to hide, no time to escape. Demonstrations have revealed dead insects in numbers never thought possible.

West can supply VAPOSECTOR, special mill sprays and fumigants, residual and contact insecticides, spraying equipment — *or a complete insect control program tailored to fit your needs!*

WEST DISINFECTING Company

42-16 West Street, Long Island City 1, N. Y.
In Canada: 5621-23 Casgrain Ave., Montreal
Branches in principal cities

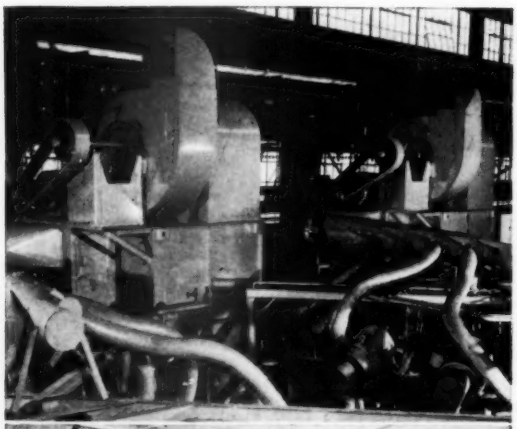
WANT DETAILS?

Tear out this coupon and mail it with your letterhead.

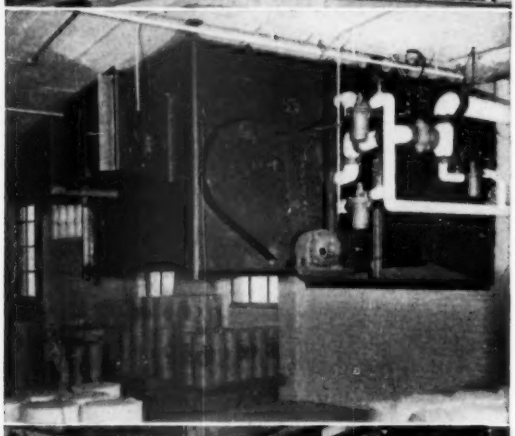
☐ I'd like a FREE copy of West's 36-page booklet on INSECT CONTROL.

☐ I'd like to talk to a West representative about INSECT CONTROL — without obligation.

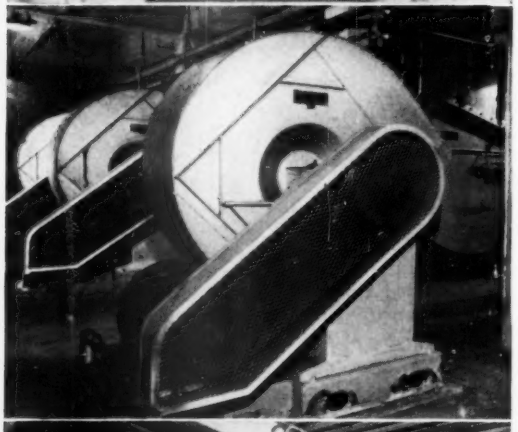
Dept. 56



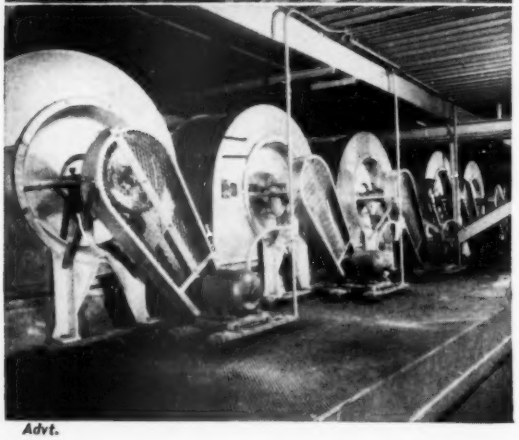
CLARAGE fans — 12 in all — on a vital-to-production dust collecting job at an automobile manufacturing plant.



CLARAGE Multitherm air conditions this section of a large paper mill where close control of temperature and humidity is essential.



CLARAGE fans operate almost continuously delivering air at high pressure in this industrial process cooling application.



CLARAGE fans shown here supply conditioned air in a pharmaceutical manufacturing plant. In all, 324 Clarage units on the job!

NEW FREE CATALOGS

Begins on page D-29

140 · Floor Absorbents. "How to solve oily floor problems" is title of this 7-page manual on floor absorbents. Gives recommended practice for any problem on any kind of floor. Case studies on use from various plants included. *Oil-Dri Corp. of America.*

141 · Floor Finishing. Here's a useful "slide rule" to help you decide which of maker's floor finishing products to use on almost any floor surface. Works for 6 types of floors, tells how to apply finishes, gives drying time. *Multi-Clean Products, Inc.*

142 · Lighting. "A Guide to Plant Lighting" is title of this 28-page manual. Tells how lighting can be used to cut costs, prevent accidents, improve morale—and more. Case studies and six steps to better lighting. *Benjamin Electric Mfg. Co.*

143 · Adjustable Bench Lamps. Here's a 20-page catalog to help you choose from maker's line of adjustable desk lamps. Gives complete specs and illumination data. Includes photographs of each model. Catalog L-5. *Fostoria Pressed Steel Corp.*

144 · Steel Shelving. Here's a 56-page catalog on steel shelving and storage equipment. Shows how a group of standardized, shop-fabricated parts fit together to make bins, shelves, counters, racks, and cabinets. Specifications and photos are included. *General Fireproofing Co.*

145 · Burner Safeguards. Bulletin CP-21 tells you how you can guard your plants against flame failure explosions. It describes maker's safeguard that shuts off fuel in 2 to 4 seconds. Diagrams show how. *Combustion Control Corp.*

➤ To get these catalogs, circle item numbers on the Reader Service card next to back cover.

146 · Water Coolers. Three models in five capacities are brought before you in this 3-page folder. Construction details, specifications, and advantages are quickly outlined for each. *Frigidaire Div.*

147 · Drinking Fountains. This 22-page catalog (No. DF-54) will help you select drinking fountains and coolers from complete line. Also sections on fountain heads, fittings and dehumidifiers, and parts. *Halsey W. Taylor Co.*

148 · Productive Maintenance. This bulletin tells about a new way to get added production from your present machines. Suggests systematic inspection and reconditioning as the key to productive maintenance. Other useful information. *General Electric Co.*

149 · Maintenance Control. This 6-page folder illustrates and describes a number of packaged maintenance control systems. Forms and systems cover everything from maintenance requests to maintenance costs. *McCaskey Register Div.*

150 · Preventive Maintenance. How to use a card index system to control preventive maintenance is told in this 4-page folder. Describes forms and procedures, lists advantages of using this type of control. *Remington Rand.*

151 · Pipe. Specifications for all pipe sizes from ⅛ inch to 24 inches are the highlight of this 16-page catalog (No. 575C). Also describes pipe fabrication facilities for structural uses. Illustrated. *L. B. Foster Co.*

152 · Insulation. Insulation for piping and equipment is covered in this 20-page catalog (No. 1N6. A2). Complete specs and property information on a dozen different fibrous glass pipe insulations. *Owens-Corning Fiberglas Corp.*

Turn the page

To get these catalogs, circle Item numbers on the Reader Service card next to back cover.

YOU, TOO, WILL PROFIT

from using Clarage air handling equipment

Clarage specializes — builds air handling and conditioning equipment **exclusively.** This "know how," backed by 40 years' experience, will mean a lot to you regardless of the size or type of your next industrial air requirement. Clarage fans and units are distinguished by **extra-heavy construction.** Result: they defy the most punishing demands; operate year after year with minimum attention. Learn more about these "stand out" performers. We'll send promptly the catalogs you request below.

CLARAGE FAN COMPANY
619 Porter, Kalamazoo, Mich.

Please send me literature on:

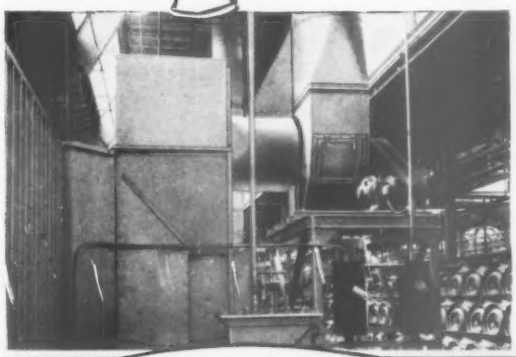
- ☐ Fans for industrial air and material handling
- ☐ Type CI cast iron fans for special industrial applications
- ☐ Type O blowers for high pressure industrial services
- ☐ Type W, Class III & IV, fans for high pressure industrial applications
- ☐ Ready Units — complete "package" fans for light-duty services
- ☐ Type NH fans for ventilating, air conditioning, and low pressure industrial process work
- ☐ Multitherms — complete air conditioning units
- ☐ Capillary Conditioners — air washers complete with fans, coils, etc.
- ☐ Capillary and Spray Type Air Washers
- ☐ Unit Heaters
- ☐ General Catalog

NAME_____

COMPANY_____

ADDRESS_____

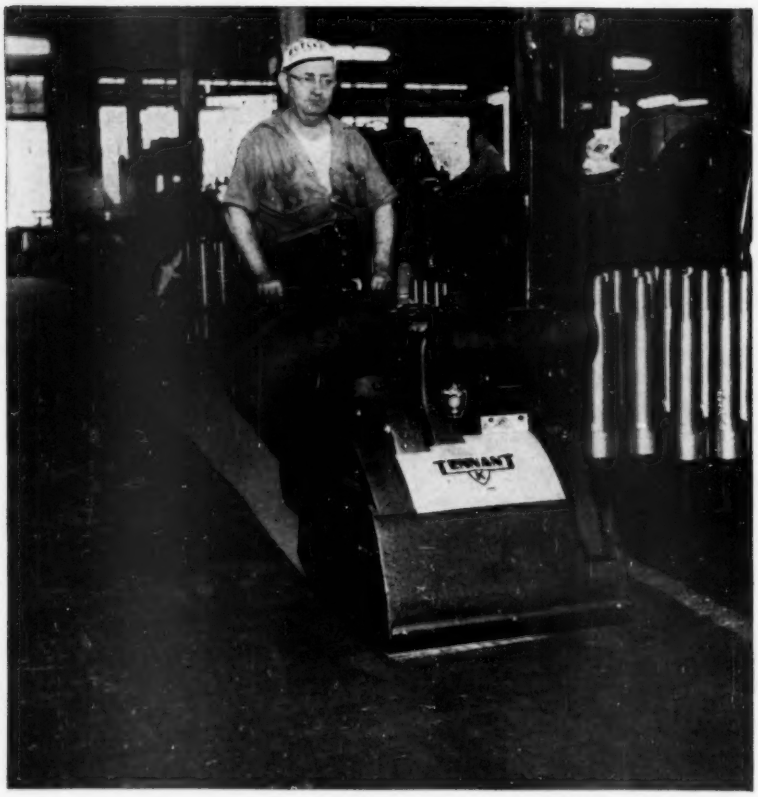
CITY_____ STATE_____



CLARAGE fans exhausting fumes from a battery of paint spray booths. Another application requiring thoroughly dependable fan equipment.

You can Rely on...
CLARAGE
Headquarters for Air Handling and Conditioning Equipment

SALES ENGINEERING OFFICES IN ALL PRINCIPAL CITIES • IN CANADA: Canada Fans, Ltd., 4285 Richelieu St., Montreal



How one man with a TENNANT Floor Machine . . .

TENNANT "K" dry-shaves dirt from floor; cleans 16" path.

shaves grease-caked dirt from factory floors – in 1 operation

As you guide it down an aisle, this big powerful TENNANT Machine does a cleaning job you'll find hard to believe. It outperforms a crew of men.

It combines 3 operations, shaving off thick grease-caked dirt at the rate of 8 to 20 lbs. per minute!

1. Shaves off thick deposits from floor by high speed pulverizing action of scarifying cylinder. Cleans 16" path. Works *dry*—no need for water or detergents.

2. Smooths and levels surface by exclusive planing action; doesn't dig or gouge floor. Helps level humps. Leaves good clean surface for fast, safe trucking.

3. Picks up soilage as it goes. Hurls traffic-packed dirt and grime into hopper. Does entire cleaning job in 1 operation. Gas or electric models (to 7.3 hp); also 25 hp mobile-type units. *Write today for details.*

TENNANT
ESTABLISHED 1870

G. H. TENNANT CO.
2554 N. 2nd Street
Minneapolis 11, Minn.

FLOOR MACHINES
INDUSTRIAL MAINTENANCE EQUIPMENT

NEW FREE CATALOGS

Begins on page D-29

153 · Air Compressors. In this 24-page catalog (No. C94) are illustrations and features for a varied line of air compressors. Specs and selection data. General information on compressors. *Curtis Pneumatic Machinery Div.*

154 · Mobile Air Compressor. A 16-page catalog (No. 5340) tells all about self-propelled air compressor. Describes how to select, suggests applications. Complete rundown on construction details and accessories. *Schramm, Inc.*

155 · Air Compressors. Complete specs on maker's heavy duty air compressors in this pair of 32-pagers (Nos. A-62 and 72). Describes operation, construction details, typical installations, and applications. Auxiliary equipment. *Joy Mfg. Co.*

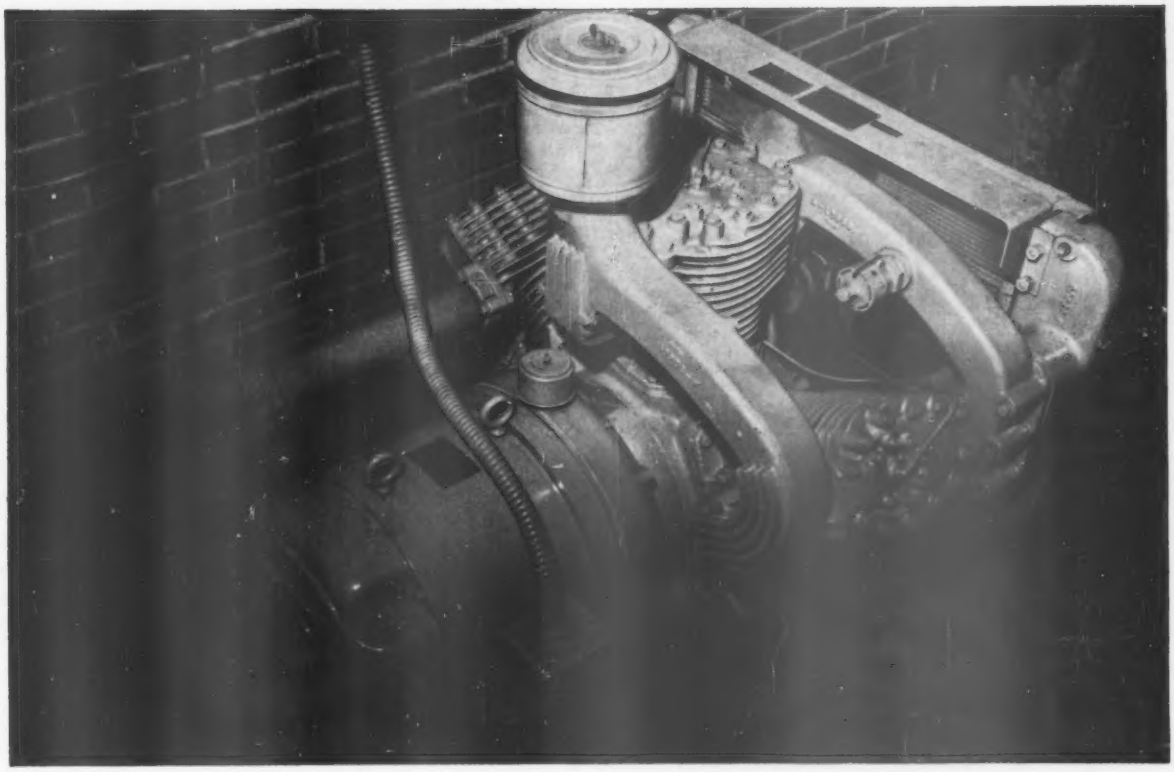
156 · Pump. A magnetic pump is subject of this folder. Lists several applications, explains principles of operation in eliminating many difficulties encountered with conventional pumps. *Fostoria Pressed Steel Corp.*

157 · Compressors, Pumps. This 28-page catalog on air compressors, pumps, and accessories is packed with selection and application data. Installation and maintenance data are included. *Kellogg Division, American Brake Shoe Co.*

158 · Pumps and Equipment. A 4-pager on pumps, motors, controls, and pumping units. Illustrations and features for each in this condensed catalog (No. 146). *The Denison Engineering Co.*

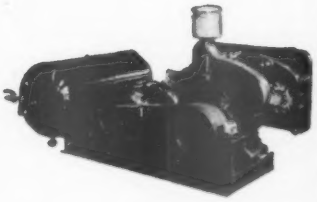
159 · Rotary Pumps. Four models of rotary pumps are fully illustrated and described in this 8-pager. Specifications, photographs and dimensions for each. Catalog

To get these catalogs, circle item numbers on the Reader Service card next to back cover.



SAVE ALMOST A MILE EVERY HOUR IN PISTON WEAR* WITH A JOY WL-80 COMPRESSOR—

** Piston speed is lower than that of four comparable compressors. So low that you save over 6½ miles of wear each 8-hour day.*



Joy WL-80 "Packaged Unit" Compressor can be delivered ready-to go, complete with air receivers, piping and wiring.

NEED A SMALL, COMPACT COMPRESSOR as an auxiliary air supply? Or possibly you want a compressor that can be placed right where the air is used and eliminate long runs of piping.

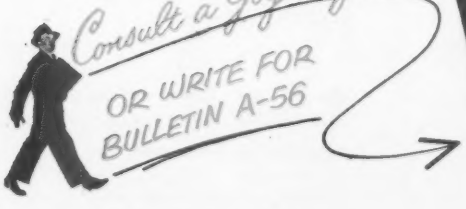
If your requirements call for 640 CFM or less, there's a Joy WL-80 for you:

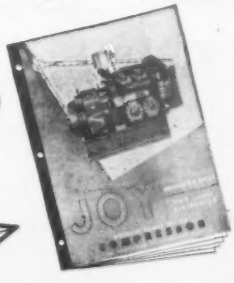
- *15 to 125 HP.*
- *81 to 641 CFM.*
- *Pressures to 125 psi, standard. (High pressure units to 250 psi).*
- *Single or two stage.*
- *Air cooled.*
- *Force-feed lubrication.*
- *Eleven models.*

. . . And, you have your choice of drives: Direct, V-Belt, Flange-Mounted. In fact, these compressors are available as packaged units, like that shown at the left, delivered complete with air receivers, piping and wiring.

* * *

Get full details by writing for Bulletin A-56. ● ***Joy Manufacturing Company, Oliver Building, Pittsburgh 22, Pa.*** In Canada: *Joy Manufacturing Company (Canada) Limited, Galt, Ontario.*





WaD 4942

JOY

SPECIALISTS IN THE COMPRESSION AND MOVEMENT OF AIR AND GASES SINCE 1885

Keep plant trash off the Path of Progress

BRULÉ
TRASH BURNER

The FG4-T5 featured here is a compact, patented, portable, fast-acting, and specially engineered packaged unit — for on-the-site assembly — that is a cost-saving addition to any plant.

As you plan for a more productive plant with savings in operating costs.... FIGURE ON TRASH BURNING EFFICIENCY

The BRULÉ goes hand in hand with new building plans, with expansion of facilities, and with modernization of present space.

This organization is specifically engaged in incineration and therefore, through this specialization, has advanced numerous features. The FG4-T5 unit has air-cooled walls—secondary air intakes insure complete combustion—entirely suspended brickwork frees walls from mechanical strain—feeding is easy through a charging door — burning, embers or hot ashes can't fall out—BRULÉ Step and Flat Grates assure peak fire chamber temperatures—no stoking. Has a firing chamber into which wastes are charged, a combustion chamber for complete combustion and in which fly ash separates out, and an upper chamber which assures ultimate completion of combustion. The unit operates on as low as an 18-ft. refractory lined stack included in the complete package. It's easily bolted into place. The unit has a capacity of 500 lbs. per hour, reducing trash to one pound of ash.

COUPON FOR YOUR CONVENIENCE

BRULÉ INCINERATORS, 407 So. Dearborn St., Chicago 5, Ill.

☐ Please send Bulletin 528 ☐ Name of nearest sales office

Company .....

Your name .....

Address .....

City ..... Zone ..... State .....

NEW FREE CATALOGS

Begins on page D-29

954. The principle of operation is described. Tells when to use. *Geo. D. Roper Co.*

160 · Pipe Insulation. Here's the story on maker's one-piece molded fibrous glass insulation. Features, specs, applications. Chart shows efficiency of each type and gives available sizes and thicknesses for the insulation. *Gustin-Bacon Mfg. Co.*

161 · Pressure Pipe. Asbestos cement pipe for overhead industrial water and process lines is subject of this 24-page catalog. Shows typical installations, applications, describes available fittings for the pipe. *Johns-Manville.*

162 · Pipe Insulation. Lightweight pipe insulation is subject of this 4-page bulletin. Tells how to apply, describes features, and gives thermal efficiency of the material. Table gives available sizes. *Baldwin Hill Co.*

163 · Plumbing and Heating. Bathroom fixtures, boilers, radiators, and burners are subject of this 16-page catalog (No. AD1814R2). Illustrated features and advantages of each product are included. *Crane Co.*

164 · Protective Coatings. Three data sheets (Nos. 575, 578, and 599) give you the story on neoprene base material for use as chemical resistant coatings on equipment and floors. Instructions for use. *Pennsylvania Salt Mfg. Co.*

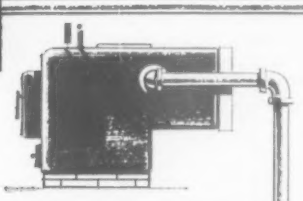
165 · Flexible Duct. Two bulletins tell where to use and how to select maker's flexible ducting for air handling, fume removal, dust collecting, and materials handling applications in your plant. *Flexible Tubing Corp.*

Turn the page

To get these catalogs, circle item numbers on the Reader Service card next to back cover.

IF YOUR HOT WATER NEED IS HERE
(remote from central heating plant)

AND YOUR BOILER PLANT IS HERE
(far from cafeterias and wash rooms)



TO LOWER COSTS IN SUMMER MONTHS
(shut down the central heating plant)

INSTALL BURKAY INDUSTRIAL WATER HEATERS
(proved through millions of industrial gallons)

NEAR THE POINTS OF HOT WATER USE
(cafeterias, washrooms, manufacturing processes)

Cutaway view of Model 618 that produces 140° and 180° or hotter water at the same time by means of patented A. O. Smith Burkay Booster-Recovery System.

Here's a proven way to get hot water constantly . . . wherever you need it, with a small, compact unit . . . the A. O. Smith BURKAY Commercial Water Heater!

BURKAYS will produce 180° sanitizing water for cafeterias *plus* 140° general purpose water . . . *both* at the *same* time!

For processing, Burkay Commercial Water Heaters hold to the amazing minimum of 2° F. . . . give *any* amount, *any* temperature hot water for year after year of gruelling service. Close temperature control saves money by eliminating wasteful overheating!

- **Install as Easily as a Domestic Heater**
- **Overhead Installations Save Floor Space**
- **Can't Corrode Because of Copper Waterways**

Let us show you what a business proposition this is. Please write
A. O. Smith Corporation, Dept. FM-654, Kankakee, Illinois

A.O.Smith
PERMAGLAS DIVISION
International Division, Milwaukee 1

ACB PRIMER
STOPS RUST
before it starts!
Saves up to 50% Re-Painting Cost
Outdoors and indoors, on iron or steel, seal out rust-breeding moisture with long-lasting, paint-anchoring ACB Primer, the barrier against corrosion. Users report up to 50% savings in maintenance costs!
For Industry's Tough Paint Jobs!
Use Thermalite high-heat aluminum paint for metal up to 1000° F. Rubber-base Cementkote protects outside cement, cinder block, asbestos siding. Colorful Rhinamel and Toconamel for machinery and equipment. Got an industrial maintenance paint problem? Call your Tropical man!
FREE! Your business letterhead request brings "The Barrier Against Rust" with money-saving facts on rust prevention. Write today!
THE TROPICAL PAINT & OIL CO., 1122-1276 W. 70th St., Cleveland 2, Ohio
Heavy-Duty Maintenance Paints Since 1883
TROPICAL
SUBSIDIARY OF
PARKER RUST PROOF COMPANY

NEW FREE CATALOGS

Begins on page D-29

166 · Steel Gate Valves. Two models of 600-lb. small steel gate valves are brought before you in this 6-page folder. Tells how to select and where you can use, gives sizes, list prices, and dimensions. *Crane Co.*

167 · Turbo-Compressor. A series of 18 practical applications for maker's turbo compressors is contained in 12-page Bulletin No. 107D. Includes 7 pages of useful technical information and data tables. *Spencer Turbine Co.*

168 · Pumps. A pair of bulletins (Nos. M-632 and 787) describe maker's centrifugal pumps. Specifications, important features, and illustrations are included. Both suggest applications. *The F. E. Myers & Bro. Co.*

169 · Paint. A full line of paint products for interior and exterior plant painting gets the spotlight in this 16-pager. Directions on when to use each type and how to apply. *Barreled Sunlight Paint Co.*

170 · Metal Framing. This 24-page catalog (No. 600) illustrates 46 different kinds of racks that can be built with company's all-purpose metal framing. *Unistrut Products Co.*

171 · Constructor. A 55-page catalog lists many projects of this construction and engineering company. Also describes the organization and its services in various types of building design and construction. *F. H. McGraw Co.*

172 · Steam Accumulators. An 8-page bulletin gives advantages of using maker's steam accumulators, and suggests practical applications in balancing steam supply with demand. *Foster Wheeler Corp.*

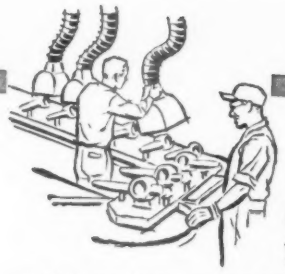
Turn the page

To get these catalogs, circle item numbers on the Reader Service card next to back cover.

Here's how to:

Spiratube®

Here's a completely different type of ducting specifically designed to meet today's imperative need for reduced plant maintenance and operational costs. Spiratube is a highly flexible, lightweight, easy-to-install duct made of continuous helical coils of spring steel reinforced with overlapping plies of tough, multicoated fabric.

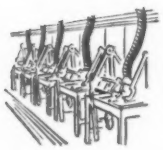


Modernize your operation

With Spiratube you can put even your oldest machining operations years ahead. Now, with Spiratube, you can eliminate such maintenance-heavy set-ups as ball-and-socket joints, rigid ducting in off-center mixing operations — and the like. Spiratube rides with ease through any operation where an exhaust hood must follow the work. For instance, more and more woodworking operations are using Spiratube in place of more cumbersome ball-and-socket systems, and many important buffing operations are more modern, trouble-free with Spiratube at the end of moving exhaust hood.

Cut fume removal and air handling costs

You're missing a good bet if you haven't discovered the many advantages of using Spiratube as an important part of your ducting system. It is a lightweight, retractable, noncollapsible ducting offering optimum flexibility to take tight turns up to 180° without buckling! And, because YOU can install Spiratube yourself in a fraction of the time it takes to install rigid ducting, you save money . . . and production downtime. No special elbows or fittings are needed with Spiratube.



Simplify plant maintenance

There's a type of Spiratube available for every important maintenance operation in your plant . . . as an integral part of your dust-collection system, for the transfer of fumes or light solids, or even for the removal of abrasive chips from large automatics. And remember, you install Spiratube when and where you need it — yourself!

Adapt your exhaust to the work

Spiratube ranks unchallenged for the removal of paint and welding fumes, gases, and odors, for, when connected to permanent or temporary exhaust systems, its amazing flexibility permits you to bring the exhaust to the very origin of the fumes . . . eliminating the cost and time of moving the work to the exhaust.

with

FLEXIBLE'S LINE OF TUBING

. . . industry's most versatile ducting

Flexible Tubing

CORPORATION

Guilford, Connecticut

Pasadena 1, California

Where to get FLEXIBLE's line of ducting

Spiratube is available from well-stocked distributors from coast to coast in diameters of from 3" to 30" with various fabrics and coatings and a special Thermaplastic Scuffstrip for extra rough usage.

For diameters less than 3", or where wide temperature and pressure ranges are a big problem, ask your local Flexible Tubing Distributor about Flexflyte.

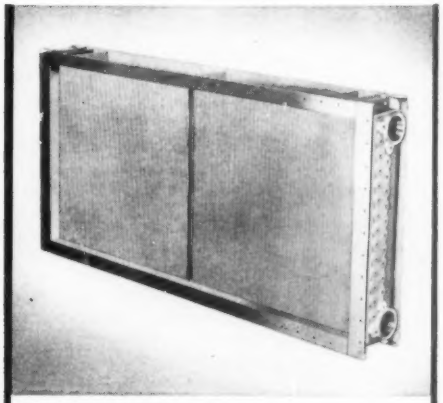
WRITE FOR ILLUSTRATED CATALOG C2-4

Simplify
Fill all your needs

one source,

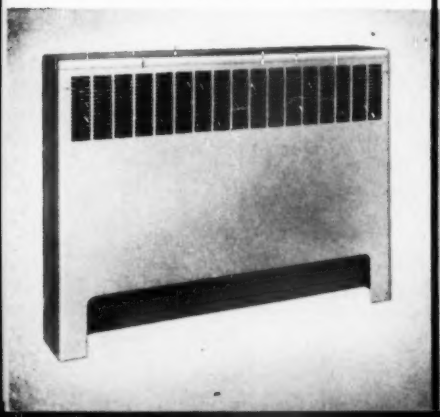
No need to shop around among a dozen suppliers—wade through oceans of catalogs—TRANE can supply just the equip-

For high ceilings TRANE Projection Unit Heaters have exclusive Louver Cone Diffusers that give up to 60% greater "distance of throw." Diffuser "steers" heat in any desired direction, gets it down to working levels for maximum comfort.

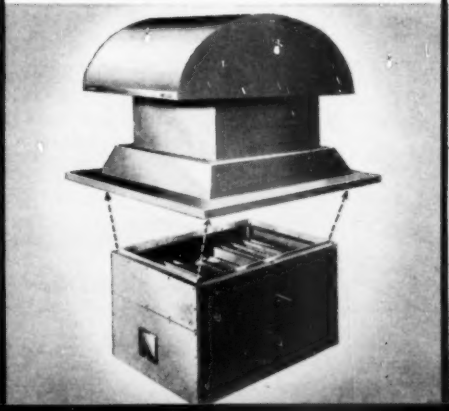


For "built-up" systems—TRANE Coils offer mechanical fin-to-tube bond that is as strong as the metal itself, gives greater heat transfer efficiency. Special steam coils with Kinetic Orifice guard against freeze-up. Coils with new Delta-Flo Fin have delta form that gives greater capacity to fin surface.

For offices, laboratories, stair wells, corridors, TRANE Convectors can be installed free-standing, recessed or wall-hung. Aluminum-copper heating element is more efficient, saves fuel. 11 cabinet styles with flat or sloping top. Convectors come assembled ready for fast installation.



To offset negative pressure—for powered ventilation, TRANE Roof Ventilating Heater combines four functions in one unit—ventilates in summer, heats in winter, tempers outside and recirculated air, ends negative pressure and infiltrating cold drafts and dirt. Louver Cone Diffuser "beams" air where needed.

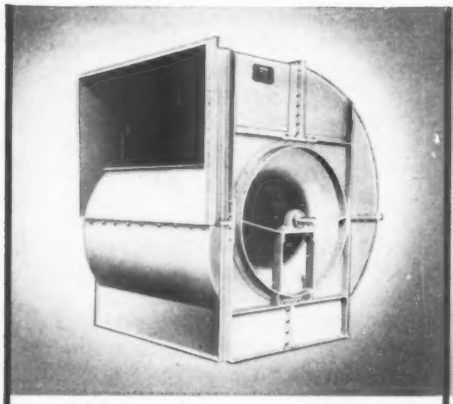


Wherever steam is used, TRANE Steam Specialties can save fuel, boost production. TRANE Float, Thermostatic and Bucket Traps get more heat out of steam. TRANE Lifetime Valve has lifetime guarantee against stem leakage. TRANE Vents stop air binding in risers and equipment. TRANE Strainers ideal for dirty lines.

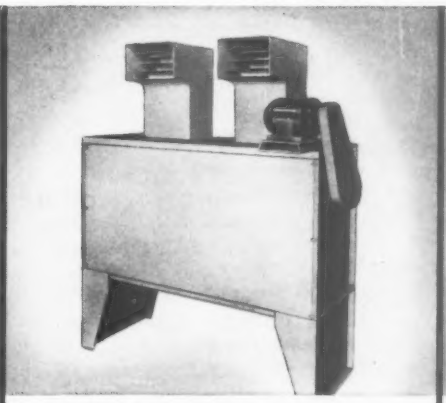
heating system checkup! from the complete Trane line!

one responsibility . . .

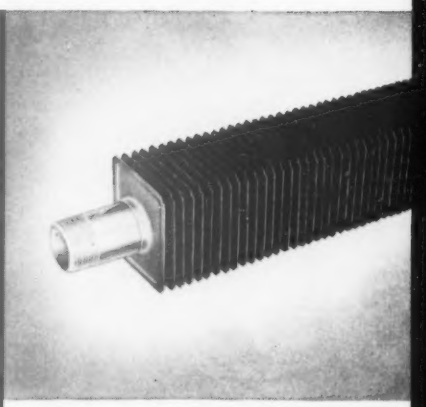
ment you need—concentrate responsibility in *one* reliable source. Make it easy—make it a "one-order" job. Call your nearby TRANE Sales Office, or write TRANE, La Crosse, Wis., for complete information.



For moving air, TRANE Fans have lower hp requirements, save power. Streamlined fan inlet cone assures even air distribution in fan wheel, eliminates noisy, power-wasting turbulence. Split fan housing permits biggest fan to pass through small openings for easy installation. FC and BI fans available to 330,408 cfm.

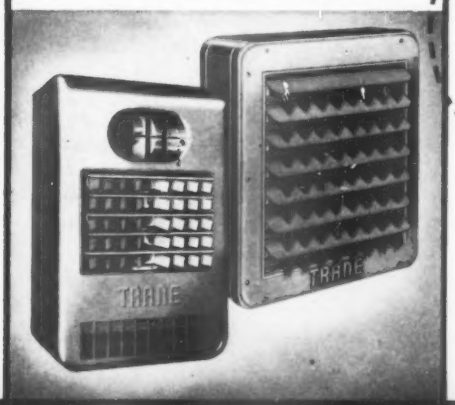


For space heating and ventilating, TRANE Torridors with powerful centrifugal fans, 20 nozzle arrangements, distribute filtered, warmed air over large areas. Can deliver air through ducts to smaller rooms, hold accurate temperatures for process applications. Ideal for shipping docks. Use for summer ventilation too.



To stop drafts from skylight, walls and windows, TRANE Wall-Fin fits in where other types of radiation can't. Resists factory abuse, vibration. Heavy-gauge enclosure available where looks are a factor. Hanger is designed to permit coil expansion and contraction.

To put heat where you want it, TRANE Horizontal Unit Heaters with exclusive Louver Fin Diffusers can give divided streams, gentle blanketing or spot throw. Steam models have coils with permanent *mechanically bonded* fin and tubes. Gas-fired units have boiler-type heat exchanger . . . no gaskets, no furnace cement.



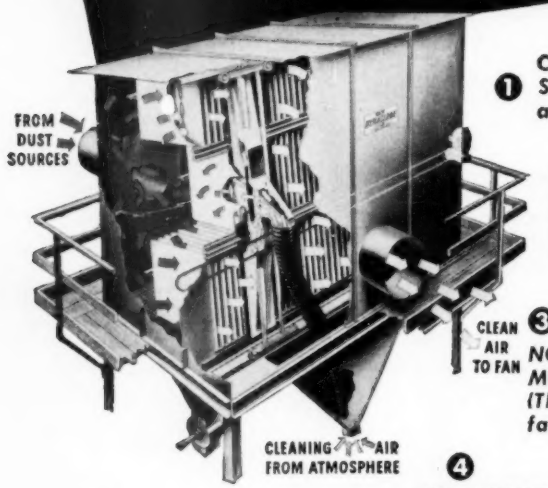
one source • one responsibility

TRANE

MANUFACTURING ENGINEERS OF AIR CONDITIONING, HEATING, VENTILATING AND HEAT TRANSFER EQUIPMENT

The Trane Company, La Crosse, Wis. • East. Mfg. Div., Scranton, Penn. • Trane Co. of Canada, Ltd., Toronto • 90 U. S. and 14 Canadian Offices

THE
DYNACLONE®
PATENTED
The ULTIMATE in Dust Filters



1. CONSTANT SUCTION at dust sources.
2. SELF CLEANING for continuous operation.
3. NO AUXILIARY MOTORS or BLOWERS (The main operating fan does the cleaning).
4. NO ABRASION of BAGS by the CLEANER.
5. LESS OVERALL HEIGHT and FLOOR SPACE.

HOW IT OPERATES

(a) Dust laden air is drawn in from the dust sources as indicated by the shaded arrows.

(b) It is diffused into the dust chamber by the baffle plate.

(c) It is then drawn through the fabric of the filter bags and is cleaned as shown by the clear arrows.

(d) Clean air passes out of the case and goes to the suction fan.

(e) Concurrently, the traveler moves back and forth across the dust wall registering successively with one bag at a time.

(f) The suction which exists in the dust chamber draws a blast of atmosphereic air through the bag in reverse directions and cleans that bag. (No shaking.)

Control your industrial dust better, for less — with the Sly Dynaclone. May we explain how?

SEND FOR BULLETIN NO. 102

THE W. W. SLY MANUFACTURING CO.
4755 TRAIN AVENUE • CLEVELAND 2, OHIO
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SLY PIONEERS & LEADERS in INDUSTRIAL DUST CONTROL

NEW FREE CATALOGS
Begins on page D-29

173 · Boiler Burner Unit. Catalog 502 describes and illustrates a boiler burner unit for high or low pressure heating, power and process steam. Exploded view illustrations, rating, dimensions, and specs. 16 pages. *Kewanee-Petro.*

174 · Valves. Plent of information on valves of all types in this pair of catalogs (Nos. 56 and 1207-V). Over 80 pages covering specs, features, and illustrations for the complete line. *Ohio Brass Co.*

175 · Asphalt Coatings. Two 4-page bulletins describe cold-applied mineral-armored asphalt and floor mastic binder. Applications and methods of installation are illustrated. Auxiliary equipment. *American Bitumuls & Asphalt Co.*

176 · Adhesives, Coatings. In this 8-page catalog you'll find fast-reading information on maker's adhesives, coatings, and sealers. Gives properties and many recommended in-plant uses. *Minnesota Mining & Mfg. Co.*

177 · Color in the Plant. Form ADV. 225 discusses advantages of colored walls, ceilings, and machinery; tells you how it improves efficiency and maintains production quality. Photos and specifications. *Pittsburgh Plate Glass Co.*

178 · Coating. Handbook (Form L-17) and price list on plastic insulation type coating to stop condensation dripping from tanks, pipes, walls, ceilings, etc. is offered. Temperature and pipe coverage charts. *J. W. Mortell Co.*

179 · Building Materials. Condensed catalog (No. 1P-6A) covers insulations, refractory products, pipe, roofing, and flooring materials. Tells how and where

▶ To get these catalogs, circle item numbers on the Reader Service card next to back cover.

HALL INDUSTRIAL WATER REPORT

Hall Laboratories, Inc.—A Subsidiary of Hagan Corporation, Pittsburgh, Pa.

Volume 2 | JUNE 1954 | Number 3

Process Bottleneck Cleared

Emergency solution of a water quality problem smashed a production bottleneck in a new midwest plant. Temporary measures adopted provided immediate relief, allowing time for design and future installation of permanent deionization equipment without the costly slowdown that would otherwise have been unavoidable.

A critical process operation called for absolutely spotless pipe sections. Although the rigid specifications for cleaning these pipes were carried out conscientiously by the plant personnel, spotting still occurred. Tan and white stains appeared on the internal surfaces when the clean sections were air-dried after a final hot water rinse. Rejections became such a problem that Hall service engineer, R. G. Hobek heard of the difficulty. Sensing that the water supply might be the critical factor, he called on Hall's specialist on metal cleaning, C. T. Roland.

Investigation of the water source and the setup for drying the pipe sections showed that as little as 5 to 10 ppm of dissolved solids in the rinse would show up in stains as the rinse water evaporated from the pipe surface. Available raw waters showed total solids in a range of 350-450 ppm.

As an immediate relief measure, Mr. Roland recommended that the plant install a temporary tank so that steam condensate from various traps in the building could be stored and used as makeup for the hot water rinse tank. In addition, he recommended that the pipe be hoisted from the tanks in such a way that the water would drain in a thin sheet from the surface. The pipe would then dry rapidly and any dissolved solids would deposit only in a small area around the lower ends.

Since condensate might not be permanently available, deionization of the water supply was recommended.

On a follow-up visit, Mr. Hobek found that the temporary changes in procedure had doubled the output of pipe, and that during the two days he observed the operation not one piece of pipe had to be recleaned.

Emergency measures such as those instituted at this particular plant are not always feasible. One way to avoid an unexpected roadblock is to seek advice *before* setting up an industrial operation using water.

Industrial Water Problems Require Special Handling

There are no "stock answers" to industrial water problems. For information, write, wire or call Hall Laboratories, Inc., Hagan Building, Pittsburgh 30, Pa.

Reprints Available

Reprints of "Practical Performance of Water Conditioning Gadgets" by B. Q. Welder and E. P. Partridge of Hall Laboratories are now available. This paper, presented in October, 1953, at the 14th Annual Water Conference of the Engineers' Society of Western Pennsylvania and now reprinted from the May, 1954 issue of Industrial and Engineering Chemistry, reports field observations of the performance of various devices claimed to be effective in treating water by non-chemical means. Write for your copy to Hall Laboratories, Inc., P. O. Box 1346, Pittsburgh 30, Pa.

Water is your industry's most important raw material. Use it wisely.

Hall Engineer Tracks Down Culprit

When Hall engineer R. D. Hugus recently reported to headquarters on trouble-shooting at a Great Lakes manufacturing plant, his running reports on the job sounded like a popular "whodunit."

First Report

"In response to a call, I visited plant at 10:00 p.m. to see what the trouble was. Two boilers were in service and water level was swinging. Hooked up cooling coil and checked steam samples. Found boilers carrying over severely."

Second Report

"Set up conductivity equipment on two boilers. I could not do a thing with the boilers regardless of whether water level was high or low. Carryover was terrific. Some conductivity values on condensed steam were 1200 micromhos—boiler water was 1800 micromhos.

"Cut off all condensate returns from E section of plant. Blew boilers every fifteen minutes with continuous blowdown valves wide open. Ran over week end this way. Conductivity came down to 4-5 micromhos and has been holding there.

"Checked samples from various points in E section. Found severe contamination at a process point where steam is used for washing parts. Material used in washing contains wetting agent. Condensate from washer will be sent to sewer."

Final Report

"No further difficulty with water level since contamination corrected."

Case Closed

"Water level in boiler now holding steady. Traps in return system also functioning much better. Drastic fluctuations no longer evident. This has been accomplished by bringing back only good quality condensate."

DURCO

DURCO Type J2 Y Valve

DURCO Type K2 Y Valve

Y is for VARIETY in chemical service

Extremely versatile, these valves are in corrosion service throughout the chemical industry where tight shut-off is required. Type J2 features renewable disc ring and Teflon® -to-alloy seating. Type K2 is similar in design with renewable seat ring for extended life. Design permits varied combination of materials and easy conversion to 90 degree angle valve by rotation of body halves. Write for bulletin V/7.

DURCO
CORROSION RESISTING ALLOYS & EQUIPMENT

THE DURIRON COMPANY, Inc., Dept. FMM, Dayton, Ohio

Please send Bulletin V/7.

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COMPANY_____

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to use each. Specifications, features, and advantages. *Johns-Manville.*

180 • Incinerators. You'll find incinerators to meet any industrial need. Covers dry waste, garbage and wood waste, pathological waste, and several other special applications. Form No. 63. *Plibrico Co.*

181 • Incinerators. Selection data is feature of this 8-pager on incinerators. Applications, specs, and illustrations for each of the products. Complete dimensions, too. Other useful data is included. *Brule Incinerators.*

182 • Unit Heaters. Two bulletins (Nos. 153 and 653) describing a line of unit heaters are offered. Construction details, capacity charts, and dimension information. Applications and advantages. 22 pages. *Modine Mfg. Co.*

183 • Unit Heaters. Bulletin HR-6 describes revolving unit heaters. It will show you how to install; gives mounting heights and coverage. Photographs feature design and construction. 16 pages. *L. J. Wing Mfg. Co.*

184 • Heating Equipment. You'll find a full line illustrated and described in bulletin No. 1101 C. Outlines temperature control system and equipment required. Application and complete selection data. *C. A. Dunham Co.*

185 • Heating, Air Handling. Here are five catalogs on heating and ventilating equipment. More than 100 pages on fans, unit heaters, blowers, portable heaters. *Herman Nelson Div.*

186 • Industrial Heater. You'll get the story on maker's heat machine in this 8-page bulletin (No.

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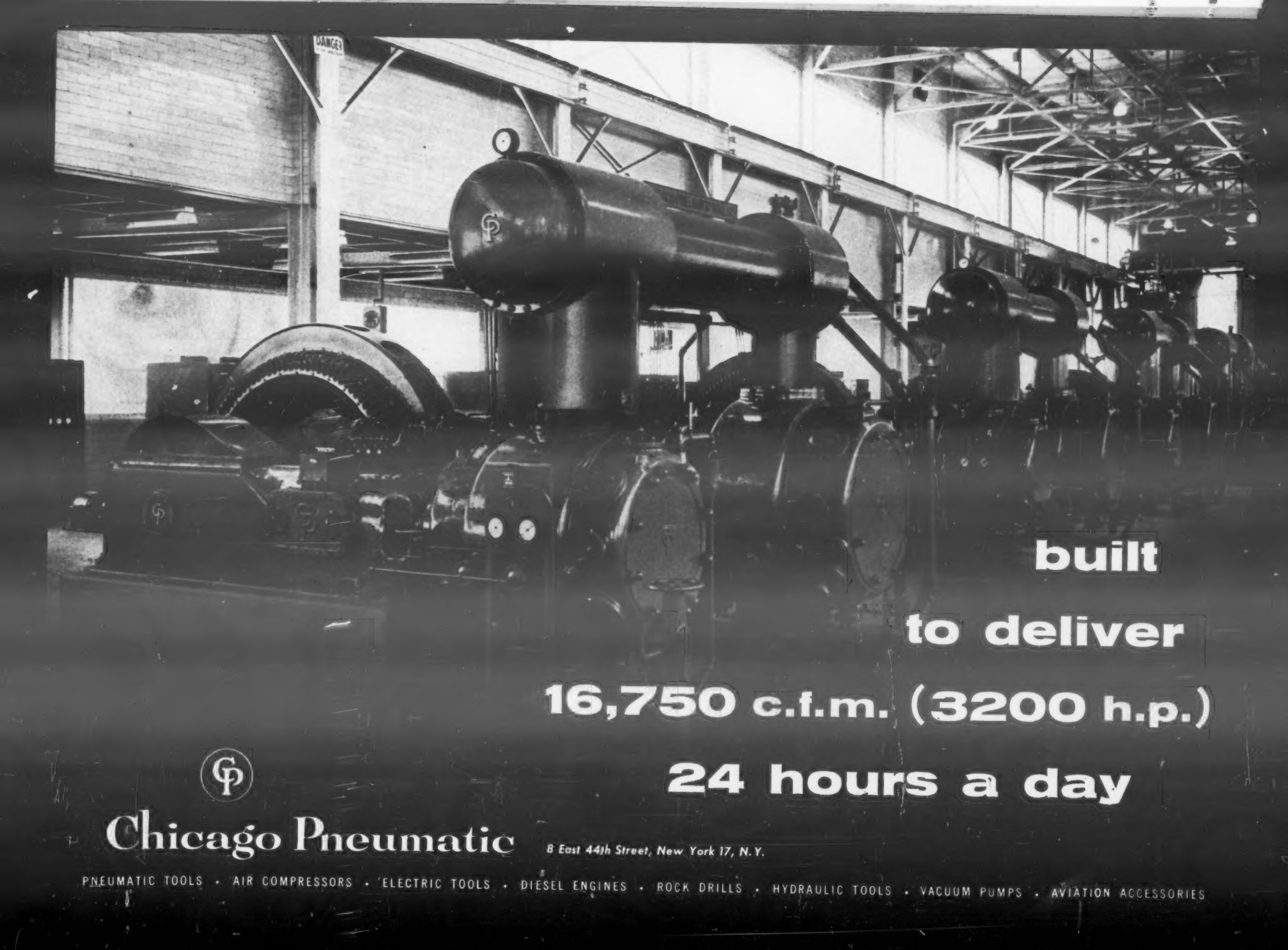
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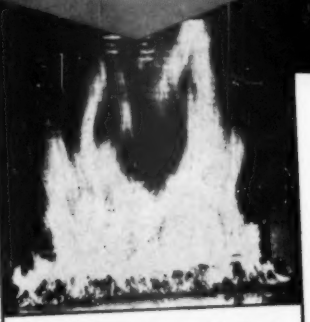
Fyr-Fyter's KARBALOY*

...PUTS OUT MORE FIRE FASTER with LESS LIQUID and PREVENTS FLASHBACK!

HERE'S PROOF! ROARING TEST FIRE OUT...in 11 SECONDS!



This raging inferno, with flames shooting 20 feet in the air, is an Underwriters' test fire in a 100 square feet pine panel.

When fire is highest, INSTANT'S KARBALOY LOADED STREAM is aimed at fire. The roaring blaze was killed in record time . . . 11 short seconds!

*Exclusive Chemical Liquid . . . available only in Fyr-Fyter Loaded Stream INSTANT Extinguishers.

This test fire is conclusive proof of Instant superiority! Karbaloy, the extinguishing liquid developed by engineers now prominent in atomic research, killed the fire in one-third time required by ordinary extinguishers . . . and only two quarts of liquid was used! Karbaloy also fireproofs as it extinguishes . . . preventing flashback or fires in rubber and other combustible materials that start up again *after* being put out by ordinary chemicals.

Fyr-Fyter Instants are designed to stop the *most prevalent fires* in wood, rubber, fabrics and other general combustibles. They require no recharging, except after use, and need no protection from freezing. The long-range Loaded Stream can be discharged at a *safe* distance of 45 to 60 feet to fight flames that cannot be approached at close range. No other extinguisher provides the combination of advantages found in Fyr-Fyter Instant Extinguishers!

Write for details today!

TEAR OUT THIS COUPON AND MAIL WITH YOUR LETTERHEAD

☐ Send full details on Fyr-Fyter Instant Extinguisher.

☐ Send a Fyr-Fyter Representative. Let's talk it over. No obligation.

DEPT. 40 FF-3

The Fyr-Fyter (FIRE) (FIGHTER) Co.

221 CRANE STREET, DAYTON 1, OHIO

REPRESENTATIVES IN PRINCIPAL CITIES

BRANCH OFFICES: *New York, Boston, Philadelphia, Chicago, Atlanta, Dallas, San Francisco, Portland, Seattle.*

RC). Features, typical installations, construction details, applications, are all included. Describes six models. *Thermobloc.*

187 · Electronic Precipitator. In this 16-pager you'll find all you need to know about maker's precipitation for air cleaning. Describes operating principle, suggests applications. Bulletin No. 250-G is available on request. *American Air Filter Co., Inc.*

188 · Fans. "How to plan your ventilating system" is title of a 32-page catalog on propeller and centrifugal fans. A useful design manual to help you solve plant ventilating problems. *Ilg Electric Ventilating Co.*

189 · Fans. In this 16-page catalog (No. J-611) are construction features, advantages, and typical installations of maker's fans. Lists applications, operating data. Complete specifications are included. *Joy Mfg. Co.*

190 · Fans. Complete line of maker's fans for air conditioning or ventilation is covered in a 90-page catalog (No. 221). Construction features, installation data section on accessories are included. *Clarage Fan Co.*

191 · Fans and Blowers. Catalog No. 600 illustrates a full line. Specifications and dimensions, features, and applications for each product. Certified rating charts are included. 20 pages. *Chelsea Fan & Blower Co.*

192 · Blowers and Exhausters. Operating features, ratings, volume capacities, other specifications for air and gas blowers and exhausters are all included in bulletin B-6 (32 pages). *Billmyre Blower Div.*

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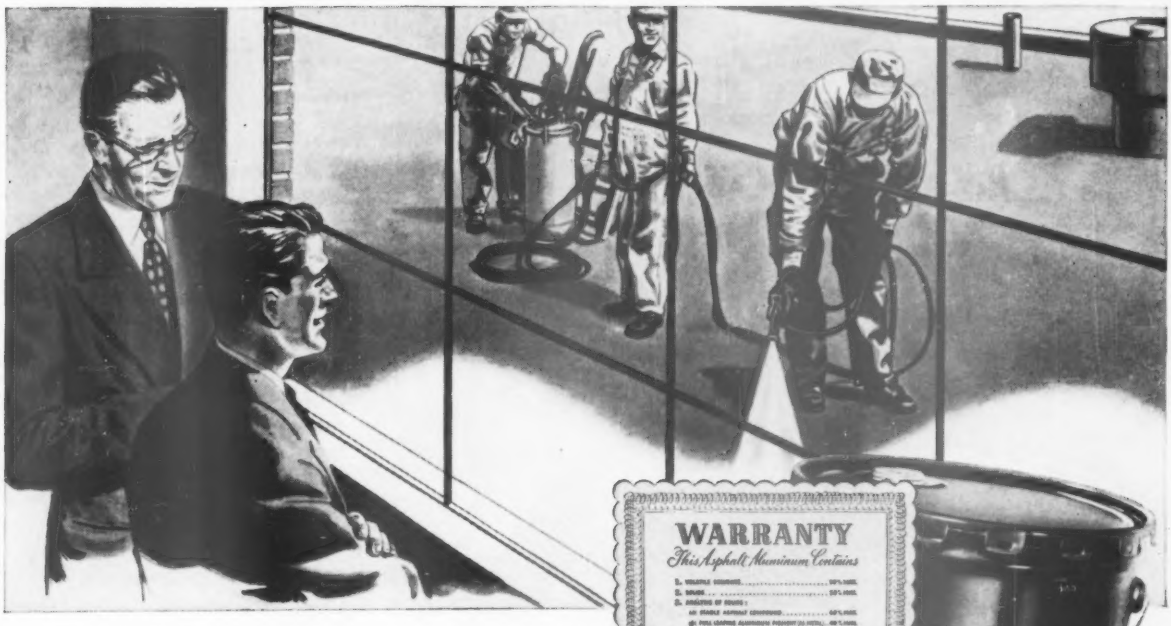


No "Overhead" Worries

when roofs are protected with

"Liquid Aluminum"

Roof Paint or Coating

Your plant is cooler in summer . . . employee morale is higher . . . roofs are well protected—for amazingly little—when you use *Liquid Aluminum* with asphalt on your plant roofs.

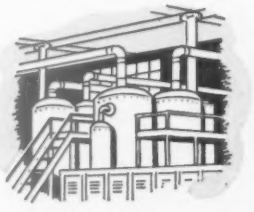
When Asphalt-Aluminum Roof Paint or Coating is properly applied, aluminum flakes rise to the surface and "leaf" on the asphalt to form a firm metallic shield. This protective shield can be applied easily with either brush or spray. And remember—it is this protective shield that adds years and years to roof life by retarding decomposition of the asphalt.

The *Liquid Aluminum* label and special Warranty Seal give you double assurance of economical, lasting, one-coat protection for your rustable metal or built-up roofs. They are marks of quality that assure the minimum amount of aluminum pigment in an approved vehicle.

Liquid Aluminum roof paints and coatings are made by many leading paint manufacturers using Reynolds Aluminum pigment. See your supplier soon, or write for names of manufacturers to Reynolds Metals Company, 2513 South Third Street, Louisville 1, Kentucky.

SPECIFY ALL-PURPOSE "LIQUID ALUMINUM" FOR GENERAL PLANT MAINTENANCE

It is made to approved minimum standards that have been adopted by the many paint manufacturers who make *Liquid Aluminum*. These standards assure you of the best combination of elasticity and durability for longest life on most painting applications. Look for the *Liquid Aluminum* label on the aluminum paint you choose for countless uses in and outside your plant.



This advertisement appears in the interest of the Paint Industry of America

It's EASY to Keep Your Floors FREE of SLIPPERY OIL SPOTS

with

Oil-Dri®

ABSORBENTS

the modern, economical oil and grease absorbents that keep your floors dry, clean and safe, and reduce maintenance costs.

A 60-SECOND DEMONSTRATION TELLS THE STORY!

MAIL THIS COUPON TODAY!

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NEW FREE CATALOGS

Begins on page D-29

193 · Floor Maintenance. How to stop slipping on your floors is subject of this booklet. Describes maker's slip-resistant floor maintenance products and shows how they can save you money. *Walter G. Legge Co., Inc.*

194 · Fire Extinguishers. A 16-page catalog brings before you a complete line of fire extinguishing equipment. Construction details, specs. Charts show properties of 10 different types of equipment, where to use each. *Ansul Chemical Co.*

195 · Air Conditioning. More than 100 pages in this big collection of catalogs. Specifications and features for unit air conditioners, coils, condensers, water chillers. *Drayer-Hanson, Inc.*

196 · Air Conditioners. Units in 3-, 5-, and 7½-ton capacities are illustrated and described in this 8-page folder. Lists features, suggests typical plant and office installations. Other useful information. *Frigidaire Div.*

197 · Dust Collectors. You'll find two types of dust collectors in this 16-page catalog. Presents features and advantages, gives illustrations and applications for each model. Accessories and selection data, too. *Torit Mfg. Co.*

198 · Vibration Control. Collection of descriptive literature on spring, rubber, and cork vibration isolators. Lists advantages and features, tells where to use each. *Korfund Co., Inc.*

199 · Thermal Controls. This 50-page catalog outlines construction details, applications, and specifications for a line of low-cost easy-to-maintain thermostats. Catalog No. 400. *Fenwal, Inc.*

Turn the page

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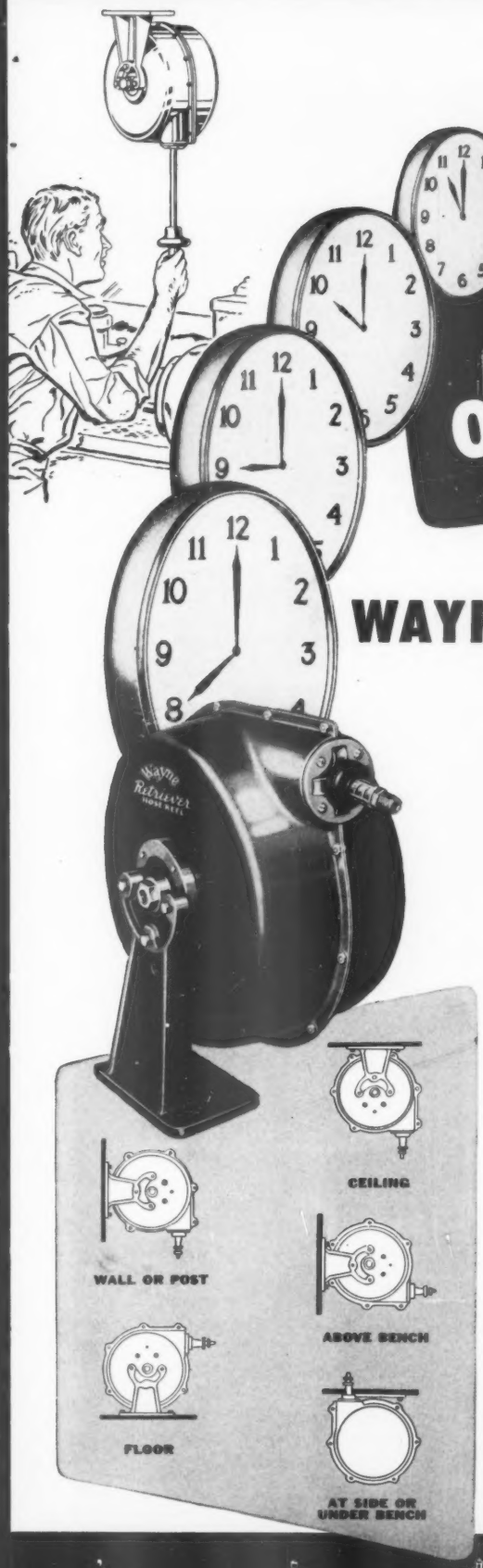

STOP WASTE MOTION...BOOST OUTPUT EVERY HOUR

WAYNE *Production-Booster* HOSE REELS

EASY TO USE: Pull tool or spray gun to required hose length . . . it locks firmly. Slight pull releases catch and hose rolls back automatically to pre-determined setting—just like a window shade!

HANDY TO USE: Tools are out of the way but always within easy reach. Mounts in any position, permits centrally located tool for use by several operators, or one. Saves working space, too.

WORK-SAVING: Cuts waste motion, lessens worker fatigue, widens work-radius. Finger-tip control of tools. Quick installation, easy adjustment, simple maintenance.

Besides all this, the Wayne Hose Reel saves wear and tear on your hose, reduces drop-breakage of tools, prevents accidents caused by loose hose.

Write for illustrated data folders on cost-cutting, job-engineered Wayne Production-Booster Hose Reels.

Compare These Wayne Advantages

Automatic Rewind	Powerful Spring Motor	Automatic Brake
Rubber Bumper Stop	Constant Spring Tension	Universal Bracket
Hose I.D. Sizes, ¼", ⅜", ½"	Rugged Steel Construction	Hose Lengths, 15' to 50'
	Open or drum-type Models	

INDUSTRIAL HOSE REELS for Air, Water, Grease, Oil, Fluids

THE WAYNE PUMP COMPANY

SALISBURY, MARYLAND — TORONTO, CANADA

Wayne

NATION WIDE SERVICE

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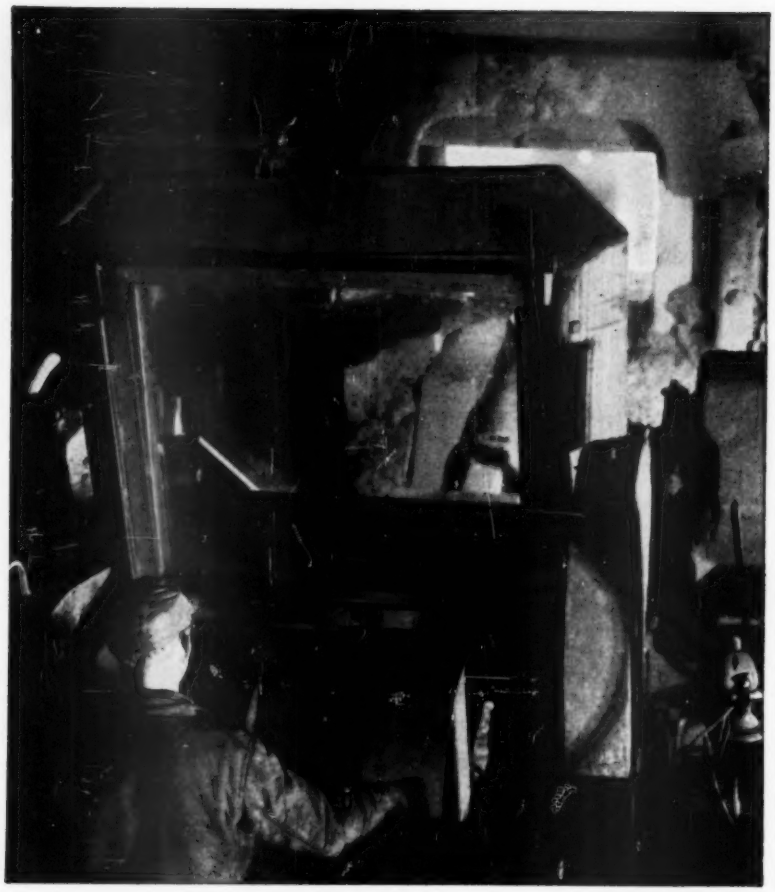

This man is driving toward

BOILING STEEL . . . Safely!

This man is operating an electric furnace charging machine in a steel mill. The only thing between him and the blasting heat of boiling steel is his windshield of *Tuf-flex*® tempered plate glass.

Made by Libbey·Owens·Ford Glass Company, *Tuf-flex* has amazing resistance to thermal shock.

Tuf-flex can take *impact*, too! A ½-lb. steel ball, dropped from a height of *10 feet* bounces right off ¼"-thick *Tuf-flex*. Yet you can see clearly and distinctly through this remarkable glass.

Think of the places in your plant where *Tuf-flex* solves a problem. Our *Tuf-flex* booklet shows typical application pictures and the unique characteristics of this unusual glass. For a copy of TF-8, write Libbey·Owens·Ford Glass Company, 7364 Nicholas Building, Toledo 3, Ohio. You can order *Tuf-flex* from your local L·O·F Glass Distributor or Dealer.

*®

LIBBEY • OWENS • FORD GLASS COMPANY

NEW FREE CATALOGS

Begins on page D-29

200 · Dust Collectors. "Dust and Fume Control" is title of this 36-page catalog (No. 72-B). Gives advantages and features of the equipment. Application data in companion 24-page booklet. *American Wheelabrator & Equipment Corp.*

201 · Shop Equipment. Collection of bulletins brings before you a complete line of shop equipment —work benches, stools, cabinets, tool stands, and hand trucks. Specifications and sizes for each. More than 50 pages. *Standard Pressed Steel Co.*

202 · Hydraulic Tools. This 64-page booklet brings you "1001 valuable shortcuts with hydraulic tools and hand tools." There's a photo, plus how-to-do-it data, for each production or maintenance idea in this useful booklet. *Blackhawk Mfg. Co.*

203 · Air Tools. Form 5053 shows the way to better plant maintenance with maker's air tools. Catalog covers air impact hammers, drills, grinding, hoists, and many other types of equipment. 12-pages. *Ingersoll-Rand Co.*

204 · Heat Transfer Equipment. Catalog No. DM-1150 illustrates and describes shell and tube heat transfer equipment. The 28-pager has a quick reading application chart, plus 10 pages of engineering data. *Bell & Gossett Co.*

205 · Saw Blades. A 26-page catalog describes metal cutting bandsaw blades. Selection data and specification sheets are included. Features and applications for each item in the complete line. *Henry G Thompson & Son Co.*

206 · Jacks. More than a score of special purpose jacks are in this 32-page catalog (No. 53). You'll

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America's Group Washing Fixtures

BRADLEY WASHFOUNTAINS

To list the factories, mills, shops, commercial buildings, schools, colleges, institutions where durable Bradley Washfountains have been installed during the past 30 years would require many, many pages of fine print. The ever widening use of these Bradley group type wash fixtures emphasizes the universal recognition of the many sanitary and economical features provided.

A central sprayhead supplies clean tempered running water to each person . . . There are no faucets to touch or maintain . . . The bowl is self-flushing to prevent collection of contaminating water . . . Foot-control eliminates water waste, too, because water supply is automatically cut off . . . Only three piping connections are required for a Bradley that serves up to 10 washers simultaneously,—reducing installation costs.

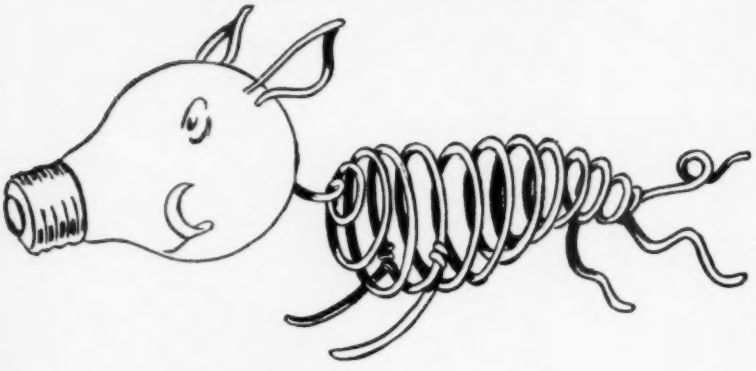
For helpful washroom suggestions for new or remodeled washrooms, write for illustrated Catalog 5204. It is yours for the asking.

BRADLEY WASHFOUNTAIN CO.,
2215 W. Michigan Street, Milwaukee 1, Wis.

BRADLEY washfountains

Distributed Through Plumbing Wholesalers

DON'T LET THIS CUR-RENTELOPE
GET AWAY WITH Your MONEY



The Cur-rentelope elopes with excess current if you don't watch out. The Cur has his lair in plants and offices that haven't followed the suggestions in the *Champion Maintenance Manual** — and that aren't equipped with the right lamps — efficient, long-lasting Champion Incandescent Bulbs and Fluorescent Tubes.

**May we mail you a free copy?*

CHAMPION LAMP WORKS
590 Broad Street, Lynn, Massachusetts

CHAMPION lamps

find features and advantages, as well as specifications listed for each type of jack. *Templeton, Kenly & Co.*

207 · Welding and Cutting Equipment. You'll see oxy-acetylene welding and cutting equipment; blowpipes and other accessories in Forms 4488E and 2500K. Photographs, capacity data, and specifications. *Linde Air Products Co.*

208 · Stud Driver. An 8-page bulletin shows how you can use power-actuated stud driver in a variety of production and maintenance operations. Illustrates available studs and equipment. Form No. 980. *Remington Arms Co., Inc.*

209 · Cutters. Hand cutting tools are the subject of this 16-page pocket-size catalog, which brings you application data on more than 50 special-purpose tools. Photos, details on each. *H. K. Porter Co., Inc.*

210 · Oil Purifiers. Here are more than 40 pages on maker's oil purifiers. You are told how they work, and how to use them in a variety of in-plant applications. Specifications and operating data included. *De Laval Separator Co.*

211 · Spraying Equipment. All types, from spray booths to spray guns, are described and illustrated in this 50-page catalog and data sheets. Tells where to use each, gives features, specifications and prices. *The DeVilbiss Co.*

212 · Pipe Machines. This 28-page catalog covers pipe and bolt threading machines, plus other price and data sheets. Gives specifications and illustrations for each model and part in the complete line. Catalog No. 53. *Oster Mfg. Co.*

To get these catalogs, circle item numbers on the Reader Service card next to back cover.

Du Pont ODORLESS* paints mean... BUSINESS AS USUAL

Now you can paint busy areas without interrupting normal routine

Solve paint-odor problems everywhere! New Du Pont Odorless Paints make annoying paint smell a thing of the past while painting is going on!

Available in all 3 sheens: gloss, semi-gloss and flat, these new paints make maintenance painting in mills, factories, offices, stores, schools and hospitals possible at *any* time—without inconvenience to anyone!

Du Pont chemists have completely reformulated these finest-quality alkyd-base finishes to provide easier brushing, quicker drying, better lap time and excellent hiding . . . give a better balance of wanted properties than ever before! For full information on new Du Pont Odorless Paints, contact your painting contractor today or write E. I. du Pont de Nemours & Co. (Inc.), Finishes Division, Wilmington 98, Delaware.

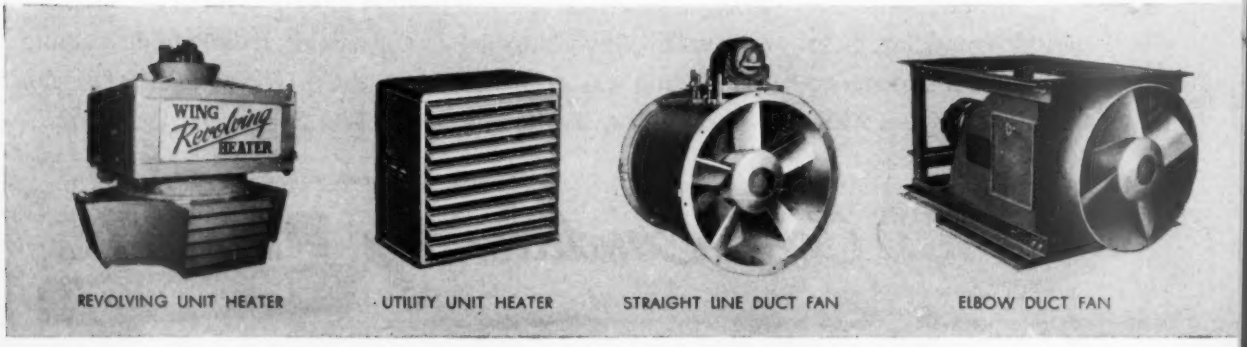
**While there are no pungent solvent odors during application, a mild resin odor may be noticed during the drying stage.*

DU PONT REG U S PAT OFF. *Color Conditioning* **PAINTS** NOW ODORLESS

BETTER THINGS FOR BETTER LIVING . . . THROUGH CHEMISTRY

In 1879, it was the new "Wing's Disc Fan"

It was 75 years ago that L. J. Wing, an ingenious Yankee who had come to New York with some ideas about mechanical devices, formed the company which later became the L. J. Wing Mfg. Co., for the purpose of manufacturing and selling "Wing's Disc Fan" which, according to his catalog, would "move more air than any other Fan made for heating, ventilation, drying, etc., as competitive trials have shown". Today, Wing products for ventilation, heating and combustion are known for their efficiency and dependability in all parts of the world. The company Mr. Wing founded has kept his ideals of originality and excellence constantly before them.



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OUR 75TH 1879-1954 YEAR

L. J. Wing Mfg. Co.

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&
MONTREAL
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EUROPEAN REPRESENTATIVE
FOR HEATERS:
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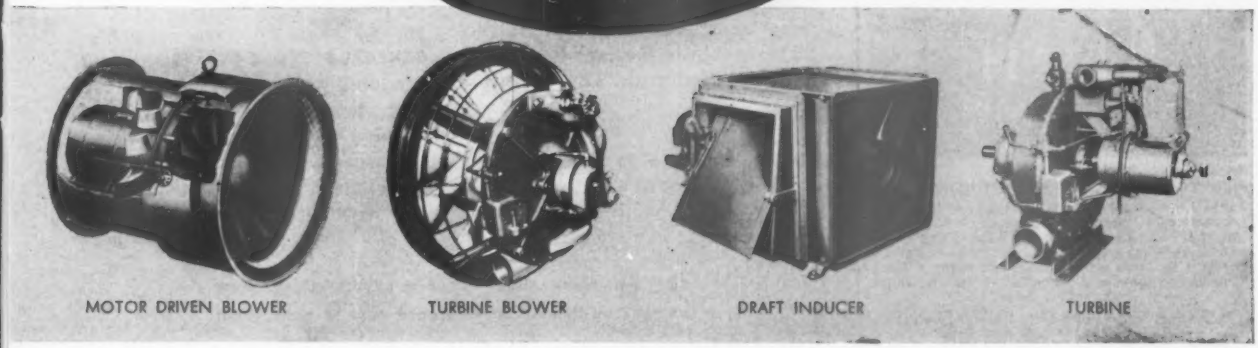
BRUSSELS • BELGIUM



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For ready reference . . .

EQUIPMENT REVIEW

. . . . of selected items announced over the past twelve months in *"What's New in Equipment."*

You'll find additional Equipment Review items starting on page 188 of Part I.

1
ACOUSTICAL TILE is dimensionally stable, and will not rot, absorb or give off odors. Called Stria. The tile reflects more than 75% of light striking it, maker says. Also has a noise reduction coefficient of up to 80%. Available in 12x12-in. and 12x24-in. sizes. *Owens-Corning Fiberglas Corp.*

2
INSULATED METAL PANELS are available in galvanized or painted steel, aluminum, or stainless, flush or fluted. Factory-assembled, with a core of fibrous glass insulation, they are ready for field erection. The panels can be installed either horizontally or vertically. *Steelcraft Mfg. Co.*

3
HEAT-RESISTANT FLOORING withstands thermal shock and will not deteriorate under extremely high temperatures. Aluminum rods embedded about 1 inch below surface disperse heat rapidly. This design enables it to be used where temperatures range up to 2000 F. *Flash-Stone Co., Inc.*

4
APPLICATOR FOR PAINTING fences, known as Fencpainter, is a mop-like applicator mounted on a roller. Paints wire fences faster and uses less paint, maker says. It's rotated against the fence by means of a long handle, while a metal guard protects the operator from splashing. A special receptacle has been designed for use with the applicator. *Fencepainter Corp.*

5
RUBBER MATTING is fabricated in single blocks or as a sectional runner with interlocking center and end sections. Air strip is offered with either a waffle pattern or solid construction backing. Available with grease-resistant properties in black only. Made in 28-in. widths and 24-in. blocks. *R. L. Mitchell Rubber Co.*

6
FLOOR DRESSING for asphalt tile is designed to pick up dust, then evaporate completely, leaving no residue, says maker. Applied with brush or spray, it is colorless and has a pleasant odor. It is nonflammable and has no flash point. *Hillyard Chemical Co.*

7
PAINT-TYPE COATINGS for wood and metal surfaces provide protection against penetration and spread of flames. They are called Albi 99 and Albi PC. When attacked by fire, they form a cellular insulating mat. When mat is scraped off, the undamaged surface is ready for refinishing, maker says. *Albi Mfg. Co., Inc.*

8
CHIMNEY MATERIAL is refractory insulated wall, jacketed with aluminum. Said to give as good as a draft as brick-constructed chimneys. Cannot rust out and requires no painting or maintenance, according to manufacturer. Comes in 36-in. sections. To get the proper chimney height, you stack the sections, and seal with an acidproof, high-temperature cement. Joints are secured by overlapping bands. *Van-Packer Corp.*

9
SPRINGBOARD MATS have a rubber-cushioned foot that insulates and prevents slippage even on wet or smooth surfaces. Mats can be tailored to fit around machines and counters. Made of seasoned oak and non-rusting steel wire, with nailless construction. *Southern Mfg. Co.*

10
GENERAL-PURPOSE RELAYS for long life and greater flexibility have been developed. Repositioning of braided shunt to reduce tension and wear is responsible for longer life expectancy, says maker. *General Electric Co.*

Turn the page

For more about these products, circle item number on Reader Service card next to back cover

Call the Ansul Man

for faster more effective fire protection

FAST, EFFECTIVE EQUIPMENT. A positive activating system puts Ansul's "Plus-Fifty" dry chemical to work immediately—no lag or delay. To insure full fire coverage, patented nozzles deliver the right kind of stream for your fire protection problem (low velocity or long range).

DEPENDABLE EQUIPMENT. Ansul extinguishers are water-tight, corrosion resistant, always ready for action, even after extreme weathering and exposure to wide temperature variations. Quality features like these make it possible for Ansul to back their equipment with a 5-year warranty.

TRAINING FOR YOUR PERSONNEL. At Marinette, Wisconsin, Ansul operates one of the largest and best equipped fire-training schools in America—to train your key protection men without cost or obligation. A trained Ansul man will also instruct your fire brigade at your plant.

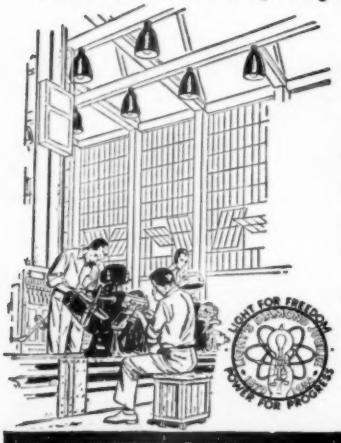
COMPLETE PLANT SURVEY. Knowing and recognizing a fire protection problem takes a highly trained man. The Ansul man is a specialist in utilizing fire extinguishing equipment properly and effectively—he will see to it that your plant gets the best protection possible at the lowest cost.

Get in touch with your local Ansul man through the "yellow pages" or write ANSUL CHEMICAL COMPANY, Fire Equipment Div., Dept. F-71, Marinette, Wisconsin.

ANSUL

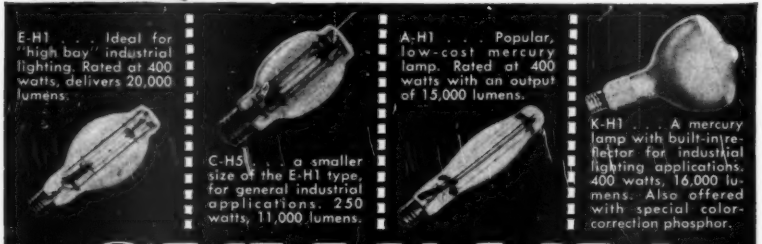
J-H1 . . . This color-corrected lamp is coated on the inside with a special phosphor which provides a "Golden White" light . . . a more pleasing color than the bluish-green of natural mercury vapor lamps.

These lamps give twice the light output for the same amount of wattage. And, they provide several times the life of incandescent lamps. As a result, Sylvania Mercury Vapor Lamps help to lower maintenance costs, improve seeing conditions . . . and speed production, too.



A COMPLETE LINE

Sylvania Mercury Vapor Lamps are available in types and sizes for every industrial requirement. Of special interest are the improved color-corrected lamps with the "Golden White" light. New illustrated folder gives complete information. Write to Dept. 4L-3106. Sylvania for your copy today!


E-H1 . . . Ideal for "high bay" industrial lighting. Rated at 400 watts, delivers 20,000 lumens.
C-H5 . . . a smaller size of the E-H1 type, for general industrial applications. 250 watts, 11,000 lumens.
A-H1 . . . Popular, low-cost mercury lamp. Rated at 400 watts with an output of 15,000 lumens.
K-H1 . . . A mercury lamp with built-in reflector for industrial lighting applications. 400 watts, 16,000 lumens. Also offered with special color-correction phosphor.

SYLVANIA

Sylvania Electric Products Inc., 1740 Broadway, New York 19, N. Y.
In Canada: Sylvania Electric (Canada) Ltd., University Tower Bldg., St. Catherine Street, Montreal, P. Q.

LIGHTING · RADIO · ELECTRONICS · TELEVISION

EQUIPMENT REVIEW

Begins on page D-56

11
STEELHARD FLOORING COMPOUND will withstand loads up to 20 tons says the maker. Formulated with tough granular plastic resins and non-stone aggregates. Can be used to patch or resurface any concrete without chipping or roughening the old surface. Ready for use 4 to 6 hours after installation, maker says. *The Monroe Co., Inc.*

12
CIRCUIT-BREAKER LOAD CENTER will protect against service interruptions caused by short circuits and overloads. Units are designed for easy assembly, addition of new circuits, and changes in capacity. The load centers and service equipment are available in four basic combinations to afford a maximum of 4, 8, 12 and 20 poles in capacities up to 100 amps. *Frank Adam Electric Co.*

13
SUBSTATION-SIZE TRANSFORMER is 6 percent lighter and 30 percent lower in height than previous model. Cooling by chimney-type radiators instead of tubes makes the reductions possible, according to the manufacturer. Available in ratings of 250 kva., and up to 15,000 volts. *General Electric Co.*

14
PACKAGED POWER PLANTS you can use, Ready-Power series of 50-, 30- and 20-kw. generators for either standby or continuous service. They're powered by Chrysler engines. Readily accessible controls for both engine and generator are located in a single, simplified control cabinet. *Ready-Power Co.*

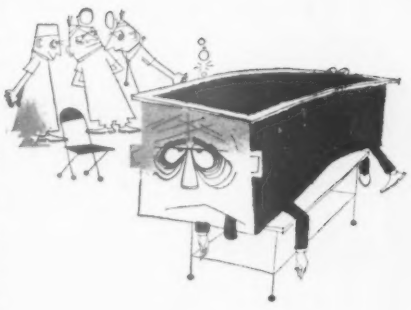
15
DUCT WIRING eliminates the need for threading and pulling conductors through. The hinged design permits wiring to be laid in place. "Lay-in" Duct is made in several sizes. A 2-piece hanger is available for mounting it. *Square D Co.*

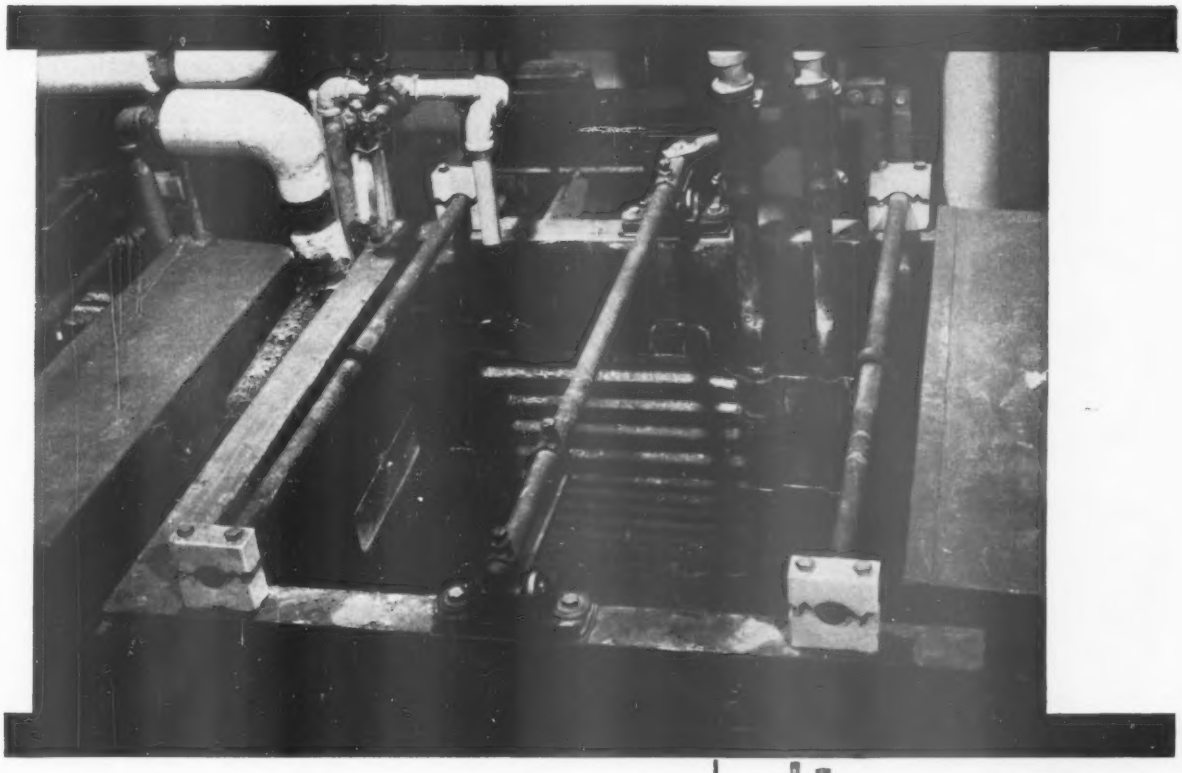
Turn the page

For more about these products, circle item numbers on Reader Service card next to back cover.

new Wyandotte Research Laboratory uses PLATECOILS *to prevent coil-itis* *

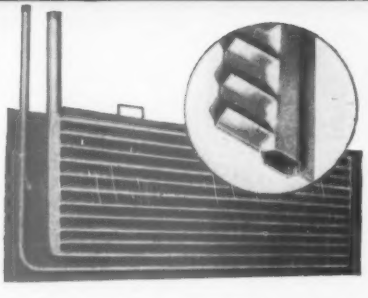
One of the finest technical laboratories in the country is the new Research Laboratory of Wyandotte Chemicals Corporation, Wyandotte, Michigan. A key feature of this laboratory is a series of 100-gallon plating and cleaning tanks made of various materials, such as rubber and plastic, which resist the actions of different types of chemicals. Individual tanks can be heated from room temperature to 212 degrees in less than an hour, by the Platecoil heat transfer units in the tanks. "We find Platecoil to be ideal because of their easy-to-clean surfaces and standardized performance," reports A. W. Liger, Supervisor of Industrial Research.





PLATECOILS *replace pipe coils for 50% of the cost*

* Coil-itis is the constant doctoring of wet processing tanks for pipe coil troubles. It can be cured easily by replacing pipe coils with Platecoils. Immediately, you will notice the difference as Platecoils put new life and profits into your heat transfer processes. They heat or cool 50% faster and take 50% less space in the tank. They save as much as 50% in initial cost and 50% in maintenance costs in addition to overcoming the limitations and operating difficulties of old fashioned and outmoded pipe coils.

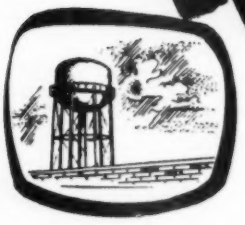


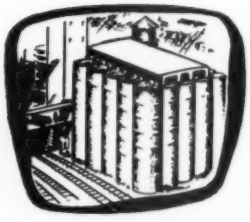
Bulletin P60 shows how Platecoils are replacing pipe coils at a savings throughout industry. Send today for your copy.

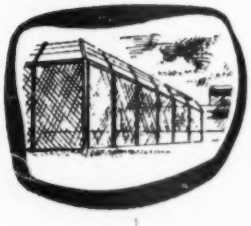
Platecoil Division, TRANTER MANUFACTURING, Inc., Lansing 4, Michigan

For fast shipment see your local distributor

For ALL-AROUND MAINTENANCE ...Paint with ALUMINUM







Your maintenance costs go down and plant efficiency goes up when you use Aluminum Paint in your maintenance program. For, remember the paint is only a small part of the cost of painting.

It's the longer life, lower overall cost and the many other values that make Aluminum Paint the best maintenance buy. Resistant to moisture and heat, reflecting light and heat rays, reducing storage tank and other evaporating losses, brightening plant interiors—these and a host of other extra values and added protection are provided.

Save on *your* plant maintenance costs by adding those extra years between repainting which Aluminum painting makes possible. Constantly held to top standards, MD Aluminum Pigments, used by a large number of leading paint manufacturers in the making of Aluminum Paint, are your assurance of the *best* for your maintenance painting requirements.

For ideas as to where Aluminum Paint can best be used in your general plant maintenance work, write today for your copy of the new ALUMINUM PAINTING HANDBOOK.

MD REGISTERED
METAL POWDERS
METAL PIGMENTS
METAL ABRASIVES
Since 1916

METALS DISINTEGRATING COMPANY, INC.
Elizabeth B, New Jersey
Plants: Elizabeth, N. J., Manchester, N. H., Berkeley, Calif., Emeryville, Calif.

2960

WORLD'S LARGEST MANUFACTURER OF FINELY DIVIDED METALS

EQUIPMENT REVIEW

Begins on page D-56

16
TRANSFORMERS for companies wishing to make their accessory equipment are available in sizes from 100 to 3000 kva. and voltages to 15,000. Cores and coils have Class B and C heat-proof insulation. *Marcus Transformer Co.*

17
PREFABRICATED CONDUIT SYSTEM for the protection of underground distribution piping and other utility services. It's designed to meet all service-tunnel requirements of industrial plants. Ric-Wil Utilidor system is prefabricated to job specifications, with the piping all in place. Provisions can also be made for electrical cables. Units are built in 21-ft. sections, with joint connections and fittings made to fit exactly into the conduit runs. Conduit diameters range from 36 to 84 inches. *The Ric-Wil Co.*

18
ALL-RUBBER CONNECTOR incorporates a new locking device designed to eliminate broken connections due to impact, pressure, and vibration. This makes for lower maintenance and replacement bills. Right-angle lugs at the tips of the female contacts engage and support the male blades. This establishes a strain-proof, locking connection, the manufacturer says. Models rated for 10- and 20-amp. service are available for 2, 3, and 4 wires. All models have corrosion-resistant cord clamps. *Rodale Mfg. Co.*

19
COMPACT MOTOR-GENERATOR unit for converting 60 cycles to 400 cycles. Called Nobrush Frequency Converter. Unit requires practically no maintenance, has reduced heating, and is compact. Outputs of 150 volt-amperes to 25 kva., single- and three-phase, are available with motor drive for any standard frequency or voltage. *Georator Corp.*

Turn the page

For more about these products, circle item numbers on Reader Service card next to back cover.

Stale air keeps 'em moving slow

Fresh air keeps 'em on the go!

INSTALL ILG VENTILATING EQUIPMENT

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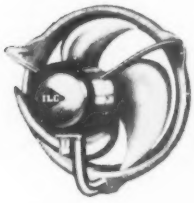
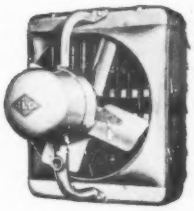


ILG Propeller Fans

Feature ILG's self-cooled motor, direct connected to fan wheel — assures extra quiet, low-cost operation. Sizes from 6" to 72".

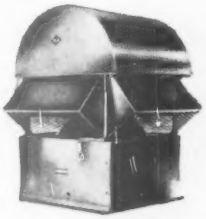


ILG Unit Heaters

The complete line — steam, hot water, gas or electric — with capacities ranging from 18,600 BTU to 286,000 BTU.

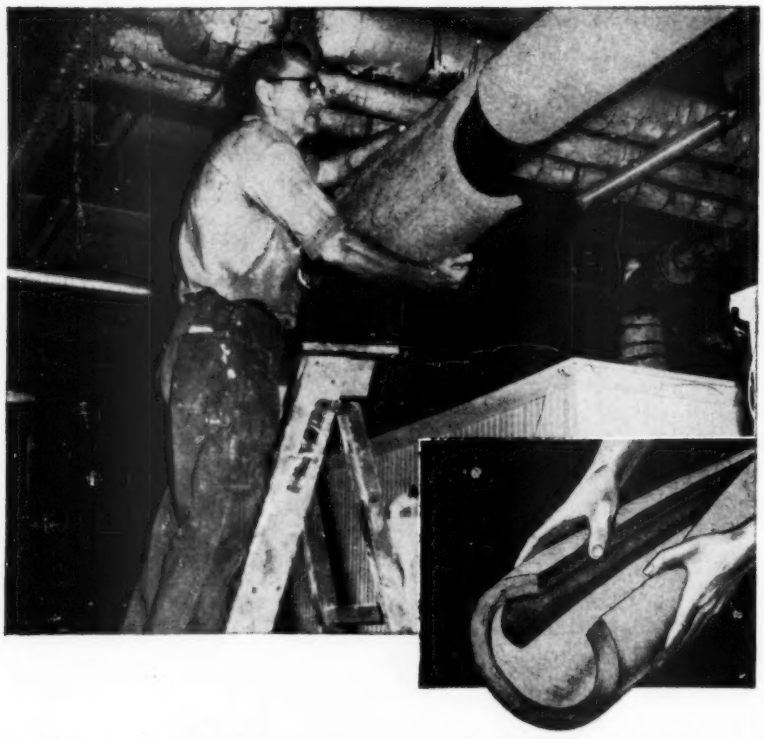
ILG Centrifugal Fans

Designed for a wide variety of pressure and volume requirements — certified capacities ranging from 374 CFM to 116,400 CFM.



ILG Power Roof Ventilators

Long-lasting, quiet, easy to install, leak-proof — provide efficient ventilation independent of wind and weather.



How Stetson saved 20% with *"that new snap-on pipe insulation"*

By using Gustin-Bacon's new "snap-on" pipe insulation of fine glass fibers, the John B. Stetson Company recently saved 20% on a pipe insulation job in its Philadelphia plant.

The major saving arose from the fact that one maintenance man did the entire installation, while other methods would have required two men. Because of the exceptionally light weight of Gustin-Bacon Ultrafine Pipe Insulation he was able to carry 6′ sections of pipe insulation up the ladder easily. Then he simply spread the section apart at the seam, slipped it over the pipe—and it snapped into place. He secured the seam with staples and binder—no wire or covering was necessary. And lastly, he painted the insulation to improve appearance.

Stetson's cost-cutting experience is typical of that of other industrial leaders across the country. So if you have a pipe insulating job coming up, write today for information. We'll send you samples and complete information on the new pipe insulation that is thermally superior . . . lighter in weight . . . won't break or crumble . . . won't absorb moisture . . . can be easily cut with a knife . . . can be painted. Write *today!*

gb **GUSTIN-BACON MFG. CO.**
246 West 10th St., Kansas City, Mo.

New York • Chicago • Philadelphia • San Francisco • Los Angeles
Houston • Tulsa • Dallas • Detroit • St. Louis

EQUIPMENT REVIEW
Begins on page D-56

20
COMBINATION A-C ARC WELDER, power unit can be changed from a 200-amp. a-c arc welder to a 5-kw. power unit with a flick of a switch. The unit is driven by an air-cooled gasoline engine for low - cost operation. Portable mountings are available. *Hobart Bros. Co.*

21
D-C ARC WELDER features ease of maintenance, added convenience, and reduction in size and weight. The use of aluminum for many components contributes to the reduction in weight. Axial-flow ventilation, with fan at the top of the unit and air intake at the bottom, permits incoming air to flow vertically. *Westinghouse Electric Corp.*

22
BUS BAR INSULATOR and support able to withstand high short circuit stresses. Used in all Plug-in Duct units. The insulator can be mounted on either vertical riser or horizontal installations. Made of a one-piece, non-carbonizing metal. *Square D Co.*

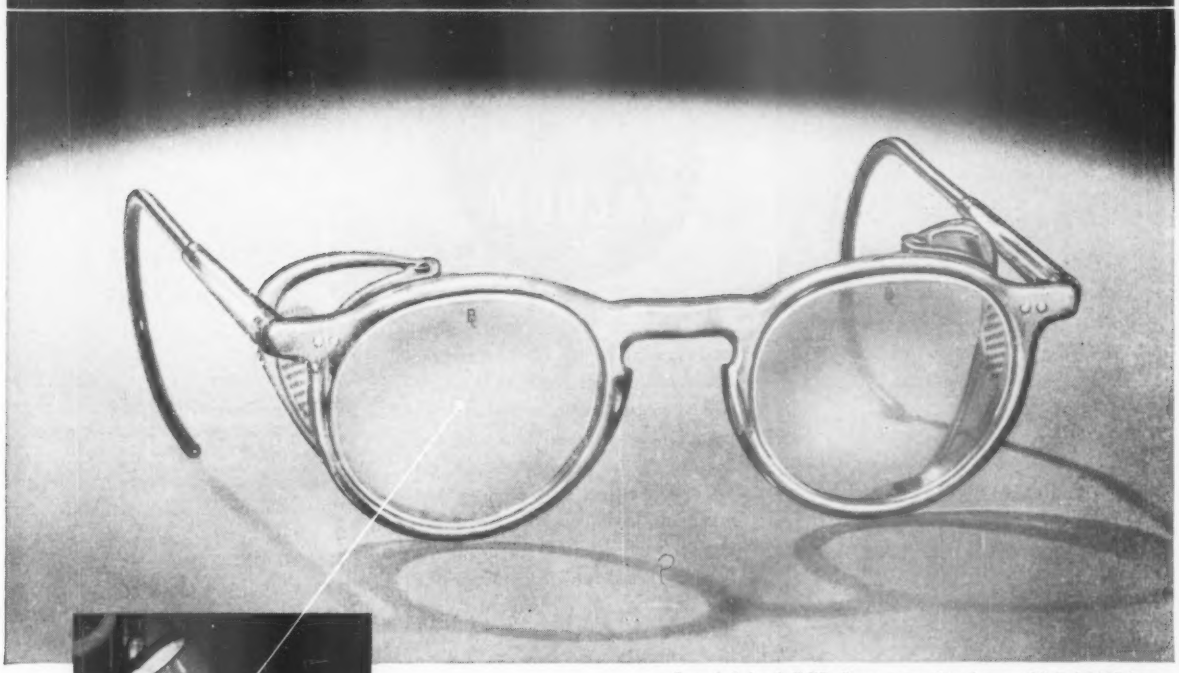
23
ONE KNOB CONTROL for selenium rectifiers provides d-c power for electroplating, electro-cleaning, and other maintenance and production jobs. It gives voltage and current changes in fine increments without interruption. Covers d-c voltage range from 0-12 volts. *Rapid Electric Co.*

24
DUST-TIGHT DISTRIBUTION PANELS are especially designed for use in hazardous locations where combustible dusts are present. Consists of a formed steel box and front welded corners. External, dust-tight handle mechanisms operate the branch circuit breakers. Available in ratings from 15 to 50 amperes, single pole, and 15 to 100 amperes, 2 and 3 pole. *Square D Co.*

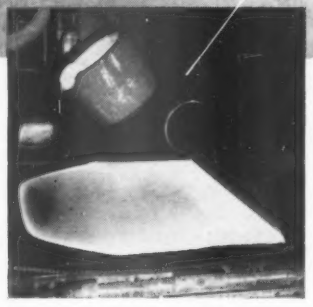
Turn the page

For more about these products, circle item numbers on Reader Service card next to back cover.

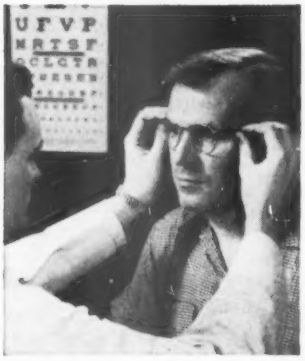
SAFETY LENS QUALITY IS NEVER A LUXURY



Bausch & Lomb Z-79 all-acetate safety frame with Bal-SAFE lenses



From sand to glass—to finished safety lenses, manufacturing methods are precision controlled in the world-famous Bausch & Lomb plant at Rochester, New York.



Where visual correction is needed, there's extra safety in Bal-SAFE lenses professionally prescribed, ground to the worker's prescription.

Bausch & Lomb glass technology insures an **EXTRA** margin of safety in Bal-**SAFE** lenses

For eye protection the lens is the thing. It may stand between a worker's precious vision—and tragic, eternal blackout.

You provide the finest protection science offers—when you specify Bausch & Lomb protective eyewear with Bal-SAFE impact-resistant lenses.

Only the finest glass is used—made in the nation's only plant devoted exclusively to production of optical glass—Bal-SAFE lenses are free from imperfections that can lead to disturbed vision, headaches and nausea. Bausch & Lomb heat treating methods insure the precise control necessary for a superior degree of impact resistance.

Acquaint yourself with Bausch & Lomb safety eyewear and with the extra quality of Bal-SAFE lenses. There's a representative in your area.

BAUSCH & LOMB

SINCE 1853

Just mail this coupon with your business letterhead to get your free copy of "Complete Eye Protection."

BAUSCH & LOMB OPTICAL COMPANY
90130 Smith St., Rochester 2, N. Y.

PLANT *Sanitation*

with SPENCER HARTFORD VACUUM

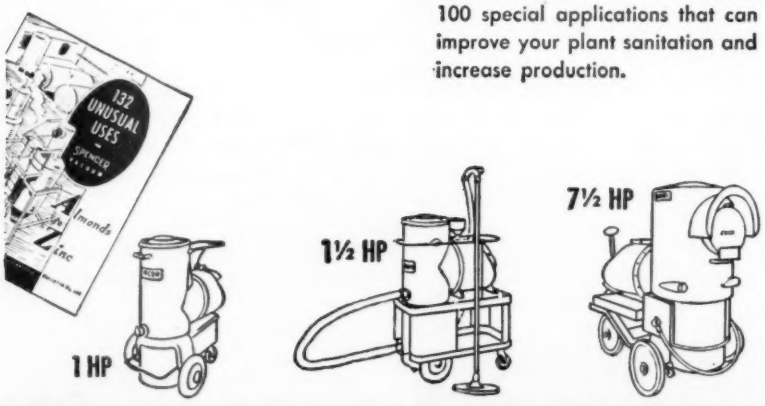
You can improve plant safety and sanitation by recommending Spencer Vacuum Equipment which will save its cost in a few months by increasing production and the quality of the product.

Take the job of handling hot materials, removing fly ash, picking up spilled liquids or handling fine chemical powders. Consider the time saved, the comfort and safety involved when these tasks are done with Spencer Vacuum.

Then consider that these Spencer machines will clean your plant and your machines at night—faster and at lower cost. That you can reclaim foods, chemicals, and metals, can speed up the assembly and inspection lines—in fact you can be sure that not only your plant, but your finished products are always clean.

Spencer representatives have special information on more than 100 special applications that can improve your plant sanitation and increase production.

Send for Bulletin No. 144 describing 132 unusual uses for Spencer Vacuum in industry.



THE SPENCER TURBINE COMPANY • HARTFORD 6, CONNECTICUT

SPENCER HARTFORD

466-A

EQUIPMENT REVIEW

Begins on page D-56

25
TELESCOPIC-BUS DUCT can be made as short as four feet, as long as five feet, or any length in between. Matching bolt holes in the overlapping bus and housing have been placed in this 1-ft. range. *Westinghouse Electric Corp.*

26
A-C TO D-C with 96% efficiency from a mechanical rectifier. That is what you can expect from this mechanical rectifier unit substation for converting a-c to d-c. Units giving up to 12,000 amperes at d-c voltages up to about 250 are available. Above this, ratings are 6,000 amperes up to approximately 500 volts d-c. For high currents, units can be parallel-operated. *General Electric Co.*

27
DEMAND METER gives visual warning when the demand load is climbing to a new demand rate-change point. The meter employs a light beam and an electronic amplifier. This permits the meter to give the desired signal without interfering with measuring or recording functions. *Westinghouse Electric Corp.*

28
CURRENT TRANSFORMER for outdoor applications. Transformer's entire exposed surface is completely corrosion-resistant to reduce maintenance costs. Also, possibility of bushing breakage is reduced by replacing porcelain with butyl. Can be mounted in a vertical, inverted, or horizontal position. *General Electric Co.*

29
CIRCUIT TRACER can be used on lines carrying as low as 2 volts and as high as 600 volts. Also, can trace circuits for continuity and the presence of a-c or d-c. Conversion from one function to another can be made easily and quickly, maker says. Unit weighs only 2½ ounces. *Delta Electrical Specialty Co.*

Turn the page

For more about these products, circle item numbers on Reader Service card next to back cover.

HANSEN REPRESENTATIVES
Quick-Connective Couplings
Are Their Business
But So Are Fluid Line Problems

For the help you need—

When You Have Fluid Line Troubles

When Hook-ups Are Being Planned or Altered

CALL YOUR HANSEN REPRESENTATIVE

In thousands of plants it's almost routine procedure to call the Hansen representative—either when actual fluid line difficulties arise—or when circuits are being planned or altered.

From years of on-the-job experience with almost every type of fluid line installation, the Hansen man can tell you what works—and why it does. For the practical know-how that will give you a real lift over the rough spots, call your Hansen representative. You'll be glad you did.

K. C. MOSIER
K. C. Mosier Company, Dayton, Ohio
Provides engineering service on pneumatic and hydraulic installations to diversified interests including refrigeration, machine tooling and general manufacturing in the Southern Ohio area.

WM. A. URSEM
F. & W. Ursem Company, Cleveland, Ohio
Offers complete sales engineering service on pneumatic and hydraulic equipment in heavily concentrated industrial district of Northern Ohio. Was first representative to introduce Hansen products to industrial trade.

RALPH A. HILLER
Ralph A. Hiller Company, Pittsburgh, Pa.
Supplies engineering assistance in the application of fluid line equipment to practically all types of industry in Western Pennsylvania—including steel mills, fabricators, and foundries—and to producers of glass, ceramics, chemicals and heavy equipment.

REPRESENTATIVES

BALTIMORE	DETROIT	NEWARK
BIRMINGHAM	FT. WAYNE	NEW ORLEANS
BUFFALO	HARTFORD	PHILADELPHIA
CHICAGO	KANSAS CITY	PITTSBURGH
CLEVELAND	LOS ANGELES	SAN FRANCISCO
DALLAS	LOUISVILLE	SAVANNAH
DAYTON	MILWAUKEE	SEATTLE
DENVER	MINNEAPOLIS	ST. LOUIS

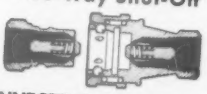
MONTREAL • TORONTO • VANCOUVER
Export Department: Cleveland

QUICK-CONNECTIVE FLUID LINE COUPLINGS

1. QUICK CONNECTION AND DISCONNECTION
2. INSTANT AUTOMATIC FLOW OR SHUT-OFF

One-Way Shut-Off

Two-Way Shut-Off



ALSO STRAIGHT-THROUGH QUICK-CONNECTIVE COUPLINGS
Send for Catalog!

THE HANSEN MANUFACTURING COMPANY

4031 WEST 150th STREET • CLEVELAND 11, OHIO

A NEW more reliable air conditioning method

with exact moisture control

FOR YOUR PROCESS OR PROTECTION

FOR TESTING PRODUCTS OR MATERIALS AT ANY TIME OF THE YEAR

ASSEMBLING ELECTRONIC PARTS

PACKAGING FOOD PRODUCTS

● This Niagara "Controlled Humidity" method gives you the **MOST EFFECTIVE** Air Conditioning because its cooling and heating functions are made completely separate from adding or taking away moisture. This assures you always a precise result. No moisture sensitive instruments are needed.

MOST FLEXIBLE. You can reach and hold any condition in response to instrument settings, or vary it as you wish.

EASIEST TO TAKE CARE OF. The machine is accessible, the control circuits are simple and easy to operate, and there are no solids, salts or solutions to be handled.

MOST COMPACT. It does a very large amount of work in a small space.

INEXPENSIVE TO OPERATE. At normal atmospheric temperatures (unlike systems that use refrigeration to dehumidify) it needs no summer re-heat.

DRYING INDUSTRIAL MATERIAL

Write for Bulletins 112 and 122

NIAGARA BLOWER COMPANY

DEPT. F, 405 LEXINGTON AVE. NEW YORK 17, N. Y.

Niagara District Engineers in Principal Cities of U. S. and Canada

EQUIPMENT REVIEW

Begins on page D-56

30
INDICATOR-REPEATING FUSES of 12-, 20-, 25-, and 30-amp. ratings are now available. The six-position fuse can be used repeatedly without replacement. A twist of the switch makes it function again as a new fuse. And a neon indicator lights up each time the fuse "blows." *Sightmaster Corp.*

31
SWITCHBOARDS for low voltage applications have been introduced in standardized sections for branch circuit breakers or switches and standardized sections for main incoming line equipment. Features include compact construction, reserve space for future circuits, and flexibility of circuit arrangements. *Square D Co.*

32
AUTOMATIC RELAY with trip lockout is designed primarily as a control on circuit breakers. Has a built-in instantaneous trip lockout feature. Adjustable reclosing time sequence of 60, 90, 180, and 360 seconds is provided by a synchronous motor. *Westinghouse Electric Corp.*

33
PHASE SEQUENCE INDICATOR is simple and compact. Saves time for electricians, maintenance men, and engineers. Has no moving parts and is easy to operate. Can determine polyphase motor rotation, transformer and alternator connections, or any other phase sequence information desired. Can be used in 110-, 220-, or 440-volt lines without use of external resistors. *United Mfg. Co.*

34
TUBING AND SLEEVING for Class H insulation is designed to retain flexibility throughout the life of the equipment to which it is applied. BH "1151" is coated with G-E's SE-100 silicone rubber compound. The insulation is produced in 27 sizes. *Bentley Harris Mfg. Co.*

Turn the page

For more about these products, circle item numbers on Reader Service card next to back cover.

How Oxygen . . . and LINDE SERVICE*

HELPED A STEEL MILL CUT "CROP LOSS" BY $60,000 A YEAR

SPECIAL PROBLEMS CALL FOR LINDE SERVICE

Time after time — as in this case of cutting high-sulphur steel — oxygen has proved to be the answer to problems that arise in mill operation. But oxygen alone isn't enough. It takes skill and experience in research, engineering, production, and distribution to get the most out of oxygen use. Through LINDE SERVICE you get an unrivaled combination of them all.

The 4" x 4" billets coming from a rolling mill in a large steel plant are 140 feet long. They must be cut to shorter length for transfer to the next mill.

Because the billets are high-sulphur steel, conventional shearing resulted in split ends. More than 100 tons of steel per month were being lost in cropping the defective ends. Production was slowed.

Then LINDE SERVICE stepped in. Working with the mill people, LINDE engineers designed and installed a high-speed oxy-acetylene flame cutting system. Result? No more split ends . . . billets are now cut quickly and cleanly. A production bottleneck was broken. The mill figures it is saving at least $60,000 a year.

If your company uses oxygen, LINDE SERVICE can mean dollar savings to you. Let us tell you more about it.

LINDE AIR PRODUCTS COMPANY

A Division of UNION CARBIDE AND CARBON CORPORATION

30 East 42nd Street UCC New York 17, N. Y.

Offices in Principal Cities

In Canada: Dominion Oxygen Company

Division of UNION CARBIDE CANADA LIMITED

***LINDE SERVICE**

is the unique combination of research, engineering, and over 40 years of accumulated know-how that is helping LINDE customers save money and improve production in their uses of oxygen and oxy-acetylene processes.

Linde
Trade-Mark

Handy extensions simplify the job of Tornado-cleaning this recently smoke-blackened wall at American Cholesterol Products, Inc.

Make a BREEZE Out of Plant Cleaning with a 300 M.P.H. TORNADO®

Detached from its base, the Tornado becomes a portable Pac-Vac—superb for cleaning hard-to-reach areas.

American Cholesterol Products in Milltown, New Jersey, maintains laboratory cleanliness in their pharmaceutical plant with a Tornado vacuum cleaner. Their Tornado makes a breeze out of such tedious jobs as cleaning soot ladened walls, and creates no sooty mess during the process.

Cleaning of chemical tanks and equipment is simplified with the handy Tornado Pac-Vac. Detached from the vacuum tank, Tornado becomes a highly portable pack-carried vacuum cleaner. Slung from a comfortable harness, the Pack-Vac makes it possible for your maintenance men to climb scaffolds and crawl behind equipment to vacuum or blow dirt from areas normally inaccessible.

The 300 m.p.h. vacuum of Tornado can make a breeze out of your floor and machinery cleaning, furnace and heater maintenance, and a hundred other jobs around shop and office. Tornado picks up wet and dry materials without conversion. Find out how a relatively small investment in a Tornado can pay big dividends for you by speeding plant maintenance and boosting employee efficiency.

WRITE FOR BULLETIN 600

BREUER ELECTRIC MFG. CO.

5084 North Ravenswood Avenue • Chicago 40, Illinois

EQUIPMENT REVIEW

Begins on page D-56

35
NOISE REDUCTION SYSTEM for large industrial areas combines the use of aluminum panels and glass fiber insulation. The corrugated aluminum panels are suspended on angles to form the ceiling. The glass fiber insulation is either placed on top of the panels or suspended from the existing ceiling. *Reynolds Metals Co.*

36
AUTOMATIC RETOOTHER makes any hand saw look like new. A V-shaped steel punch cuts away old irregular teeth and forms new ones, either rip or cross-cut, of any size from 4 to 16 points per inch. And without removing saw handles. A dial indicator insures any desired tooth pitch from 0 to 30 degrees on straight or crowned toothed edges. Comes in hand or motor drive. You can convert hand to power at any time. *Foley Mfg. Co.*

37
LEAK DETECTOR comes in a bottle. Point the plastic bottle at the pipe or equipment you want to test for leaks. Then Squeeze. The Leak-Tec sprays over surfaces and creates a cluster of live bubbles wherever a leak occurs. *American Gas & Chemicals, Inc.*

38
AIR PRESSURE REGULATOR is pipe-controlled, can reduce line pressures of up to 400 psi. to working pressures from 2 to 120 psi. It's available in ½-in., ¾-in., and 1-in. sizes. Has a light adjusting spring which simplifies regulation. Regulator is also available with remote control unit, so it can be located at any point in air system, regardless of accessibility. *C. A. Norgren Co.*

39
FLOOR PADS are capable of supporting up to 4000 pounds per square inch. Will not crumble or deteriorate if soaked in oil. Because they require no bolting or cementing—simply slip under the

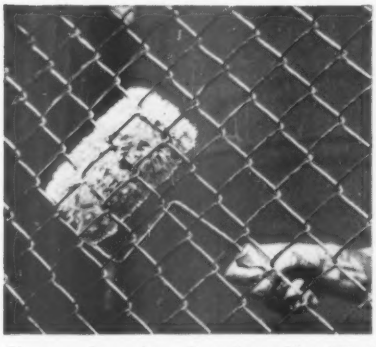
For more about these products, circle item numbers on Reader Service card next to back cover.

Cut wire fence re-coating costs!

Users Report Savings of 30% to 40% With Rust-Oleum Extra-Long Nap Lamb's Wool Roller!

Special roller glides easily over wire sections. (Rusted sections have already been primed with Rust-Oleum 769 Damp-Proof Red Primer to Stop Rust.) Finish coat is Rust-Oleum 470 R.M. Aluminum.

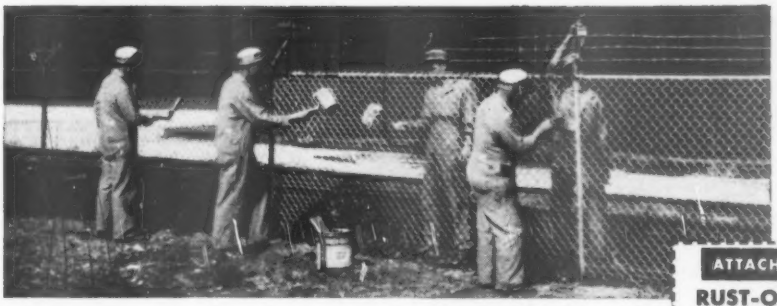
A *new, exclusive, different-type* roller! Greater diameter, specially selected skins, extra-long Lamb's Wool – all combine to give you more coverage faster and easier in the new Rust-Oleum Roller-Coating System.



Close-up shows how Extra-Long Nap Wool reaches around to coat approximately 70% of other side of fence at same time. Rust-Oleum's *exclusive* penetrating qualities saturate cross wire sections for desired mil thickness.

Man follows with "dry" roller on opposite side of fence to catch and use surplus "tears" and quickly coat remaining 30% of wire sections.

Even barbed wire sections can be roller-coated in one easy pass. 99% of the material is used on the fence – *not* on the workers, *not* on the ground.



On long distances of fencing, a 5 man production "team" can achieve even greater savings. The first man wirebrushes the surface to remove dirt, dust, rust scale, etc. The second man applies Rust-Oleum liberally by roller, coating the wire sections and barbed wire. The third man follows on the opposite side of the fence with a "dry" roller to catch and use the surplus. The fourth and fifth men work on opposite sides of the fence, brushing the pipe framework and the barbed wire arms. See how this new Rust-Oleum system can save you money. Attach coupon to your letterhead, mail *today*.

RUST-OLEUM®

STOPS RUST!

ATTACH TO YOUR LETTERHEAD – MAIL TODAY!

RUST-OLEUM CORPORATION
2455 Oakton Street, Evanston, Illinois

Please show us how your new Extra-Long Nap Lamb's Wool Roller will cut our wire fence re-coating costs. Include prices, complete literature about Rust-Oleum and nearest source of supply. We have approximately_____ yards of wire fencing.

OUT OUR WAY
NOW YOU CAN GET BACK TO THE JOB CHARLEY-- IT WON'T HAPPEN AGAIN! I GOT SOL-SPEEDI-DRI ON THE FLOOR! MEN LIKE YOU ARE THE BACKBONE OF THE SHOP!
THE BULL'S GOT HIS NERVE! I DOUBT THAT CHARLEY'S GOT A BACKBONE LEFT AFTER THE SPILLS HE'S TAKEN!
YEAH--THE SOLID FOOTING WILL BE THE END OF CHARLEY! HE'S TOO OLD TO CHANGE HIS WAYS!
THE OLD PRO
J.R.WILLIAMS

Best value—best seller!

SOL·SPEEDI·DRI

For keeping floors spanking clean — absolutely slip-proof — Sol-Speedi-Dri is way ahead of other industrial oil and grease absorbents. Proof? Industry buys more of it than any similar product. And here's why . . . it spreads fast, covers plenty of ground, "dry-cleans" thoroughly. You can count on consistent quality, too — careful laboratory controls insure that. Why not try it yourself? Send coupon today for free sample.

SPEEDI-DRI CORP. 210 W. Washington Sq., Philadelphia 5, Pa.

Warehouse stocks maintained in principal cities of the United States and Canada.

• • •

Inquirers in New York, New England, and New Jersey should write to Speedi-Dri Corp. Elsewhere in U.S. to Waverly Petroleum Products Co., 1724 Chestnut St., Phila. 3, Pa. In Canada, G. H. Wood & Company Ltd., Toronto. Branches throughout Canada.

FREE SAMPLE Fill out the coupon and mail today for free sample and literature.

*Name*_____

*Address*_____

*City*_____ *State*_____

FM-6/54

machine—the pads afford savings in equipment installation costs. *Clark-Cutler-McDermott Co.*

40
CHANNEL PIPE is designed for use in sloping drains and gutters where corrosion is present. Made of vitrified clay. Manufactured in double sections with 5 grooves in each side so builders can divide a double section at any desired depth from 4 to 12 inches. The channel can be covered with a grill or solid floor plate. *The Logan Clay Products, Inc.*

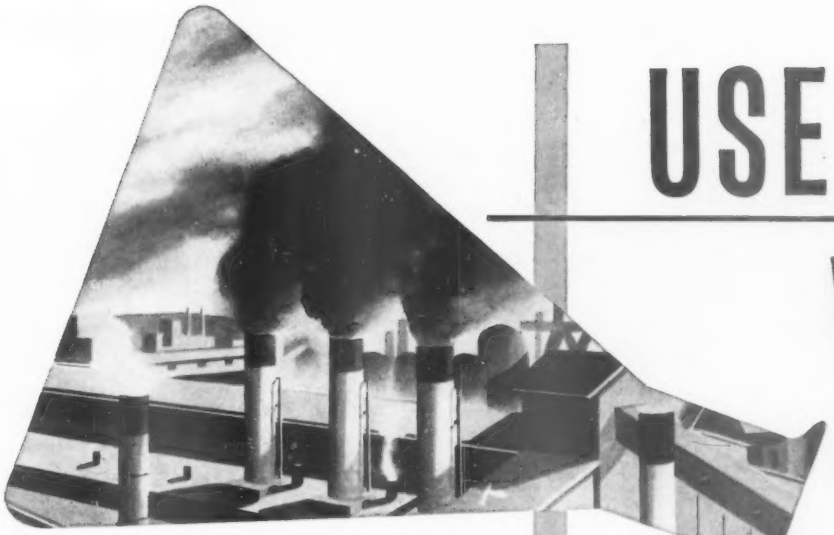
41
GAS VENT PIPE fits inside wall. The WV Metalbestos pipe has a narrow oval cross section that does the trick. It features an inner and outer pipe separated by an insulating air space. Outer pipe is galvanized steel to prevent damage in handling. The aluminum inner pipe provides a fast-heating inner stack and resists corrosion. *Metalbestos Div., William Wallace Co.*

42
OIL RECOVERY UNIT provides speedy separation of oil from parts washers, coolant sumps, and reservoirs handling liquids that contain oil. It automatically stores the recovered oil so it can be drawn off periodically, and returns the re-usable solutions to the washers. You can salvage oil and compounds normally lost; and you reduce your expenditure for coolants and compounds. *Pioneer Pump Div., Detroit Harvester Co.*

43
MOBILE WORKSHOP rolls up to the job. The 24 x 45-in. steel workbench will convert any portable electric tool into a stationary machine. Other features: Takes less than a minute to remove or replace any tool; and you can operate any tool on the Porta-Shop without disturbing other tools. *Porter-Cable Machine Co.*

Turn to page 74

For more about these products, circle item numbers on Reader Service card next to back over.

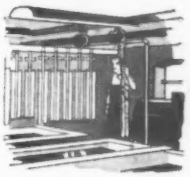


USE WASTE HEAT!

AIR CONDITIONING

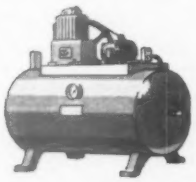
Let the adaptable Servel 25-ton Water Chiller convert waste heat, or steam from any source, into lowest cost air conditioning for your plant and offices!

PROCESS COOLING

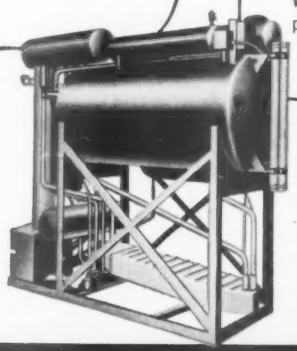


Use the cheapest energy source —even waste heat—to achieve high-efficiency cooling for manufacturing processes! Servel Water Chiller operates on dependable absorption principle.

INDUSTRIAL PRECOOLING



Increase capacity and improve performance of air compressors and internal combustion machines! The Water Chiller is compact, light; can be safely installed on almost any floor.



The Servel Water Chiller cooling system has no moving parts to wear. It is quiet and vibration-free. Light floor loading and freedom from vibration mean that no special foundations or braces are needed. Zone control is unusually easy. And operation (using waste heat, or steam from the cheapest source) is low in cost. Backed by a 5-year warranty. See your dealer or mail coupon for information and engineering co-operation.

Servel

the name to watch for great advances in

AIR CONDITIONING ✓ REFRIGERATION

SERVEL, INC., Dept. FM-64 Evansville 20, Indiana

Please send me complete information on Servel equipment for
☐ Air Conditioning, ☐ Process Cooling, ☐ Industrial Precooling.

Name_____

Firm_____

Address_____

City_____ County_____ State____

ARMOUR'S NEW LABORATORIES *producing*

Left: **Parenteral Packaging Department.** One of the areas completely air conditioned.

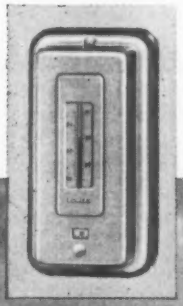
POWERS CONTROL

Above: **Hospital Gowned and Masked Technicians in Bulk Sterile Filling Area.** Here the air conditioning is treated in such a manner that aseptic operations could be undertaken with least possibility of bacterial contamination.

Below: **Low Temperature Human Blood Fractionation Plant** — *the largest in the U.S.A.* In this area there are processed 18,000 pints of human blood (or the equivalent of human plasma) weekly into Normal Serum Albumin and Poliomyelitis Immune Globulin. Processes are controlled by Powers V-Port FLOWRITE Valves. This entire room is accurately held at 23° F.

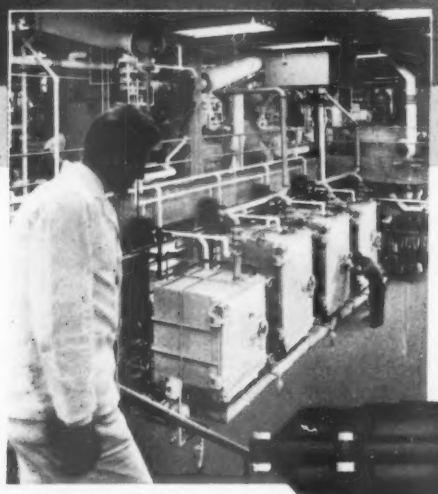
Above: **View in Parenteral Manufacturing Building No. 4** where ACTHAR, Insulin, and Intrinsic Factor (BIO-PAR) are processed. Processes here are also controlled by Powers V-Port FLOWRITE Valves.

Gamma Globulin and other pharmaceuticals...



Use POWERS AIR CONDITIONING CONTROL AND FLOWRITE DIAPHRAGM VALVES

New ARMOUR PHARMACEUTICAL CENTER, Near Kankakee, Ill.



Architects & Engineers: HOLABIRD & ROOT & BURGEE
Piping Contractor: M. J. CORBOY CORP.

Gamma Globulin for Combating Polio, Serum Albumin used by the Armed Forces for transfusion in shock and burn cases, Thyroid powder and tablets, Intrinsic Factor (BIOPAR), Insulin and ACTHAR for treatment of arthritis – production of these and many other Armour products requires accurate temperature control.

To insure the precision control of air conditioned areas in their modern $12 million plant Armour installed a Powers pneumatic control system. To accurately control the flow of heating and cooling mediums and vacuum used for various processes, they installed Powers V-PORT FLOWRITE Valves.

When you have a control problem requiring the dependable performance assured by Powers products – call our nearest office or write us direct.

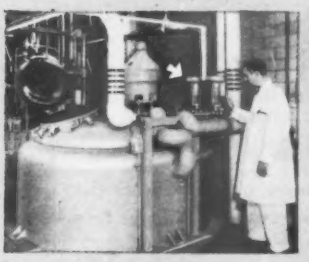
Above: **View in Solvent Extraction Building No. 5** where Insulin, Intrinsic Factor and Injectable Liver are produced. Processes are controlled by Powers V-Port FLOWRITE Valves.

THE POWERS REGULATOR CO.

SKOKIE, ILL. • Offices in Over 50 Cities in U.S.A., Canada and Mexico

Over 60 Years of Automatic Temperature and Humidity Control

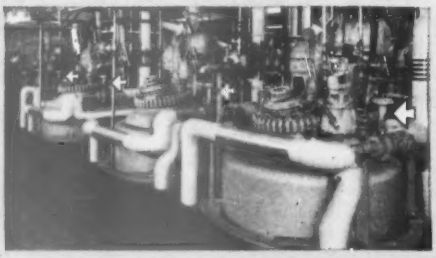
(b70)



Powers FLOWRITE Valve
Characterized V-PORT Type

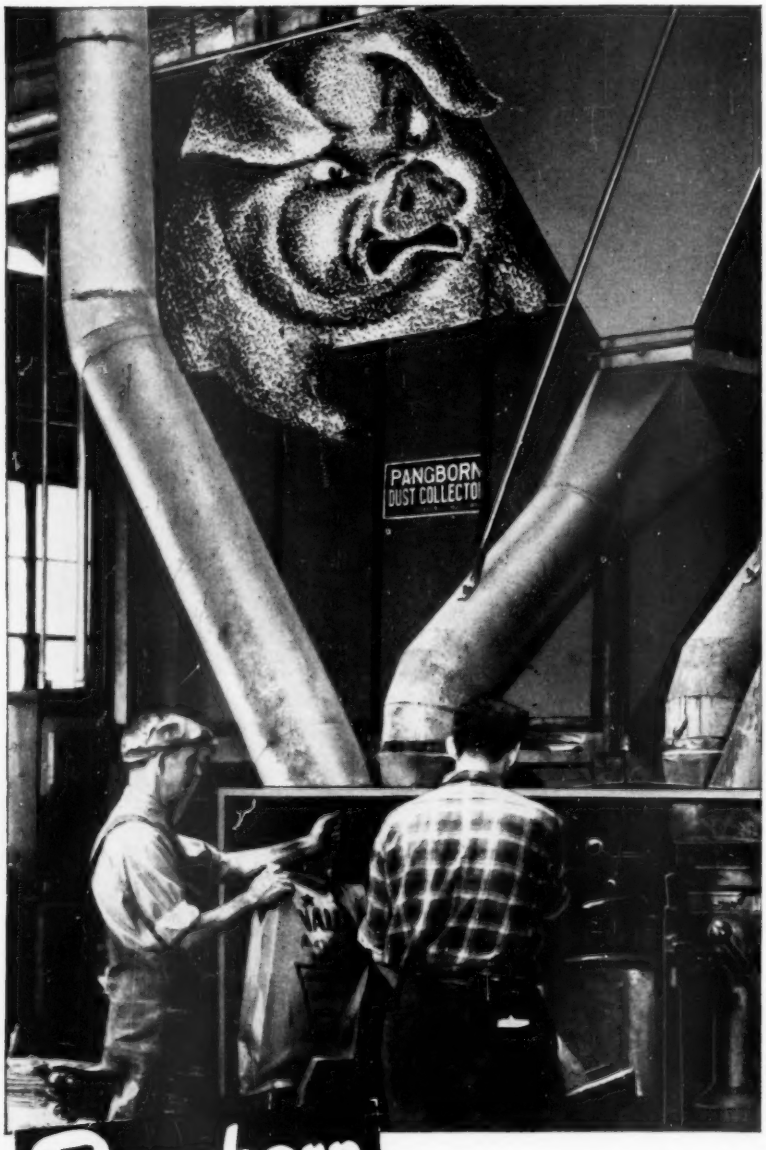
Gives BETTER Control with Less Maintenance

Over 100 are Used in Armour Laboratories.



ACCURATELY CONTROLS STEAM, WATER, VACUUM AND PROPYLENE GLYCOL AT ARMOUR LABORATORIES

PANGBORN **STOPS** THE DUST HOG



Pangborn DUST CONTROL

Saves $14,800 per Year

for National Aluminate Co., Chicago, Ill.—by salvaging 3,900 lbs. of valuable chemical dust daily. In addition, Pangborn Dust Control at Nalco reduces housekeeping costs, cuts repair bills, improves working conditions.

How much can Pangborn save you?

Pangborn engineers will be glad to discuss *your* dust control needs, show you how Pangborn equipment can save you time, trouble, and money. For a no-obligation discussion of your specific needs, write to: PANGBORN CORPORATION, 2100 Pangborn Blvd., Hagerstown, Maryland.

PANGBORN'S 50TH ANNIVERSARY • 1904-1954

EQUIPMENT REVIEW

Begins on page D-56

44
WATER-COOLED AFTERCOOLER has been designed for removing oil and moisture from compressed-air systems. The aftercooler has longitudinal inner-fins that permit maximum heat transfer with minimum pressure drop, maker says. Made of copper and brass for high corrosion resistance and long life. *Heat-X-Changer Co.*

45
MULTI-PURPOSE TOOL for maintenance is this metal-working machine with 52 easily changeable accessories. Capable of performing over 50 different machining operations. Only 10 minutes is needed to change the accessories for different operations. Spindle speeds ranging from 65 to 2800 rpm., in 24 steps, are produced by the vee-belt motordrive of the basic unit. *Newage International, Inc.*

46
RECTIFIER UNIT provides a d-c source directly from a-c. Just plug it into the a-c outlet. The My-T-Midget Rectifier is designed especially for use with small d-c-operated machinery. The unit employs selenium cells for its converting action. D-c output is 110 or 220 volts. Available in sizes from 1 to 8.5 amperes. *American Rectifier Corp.*

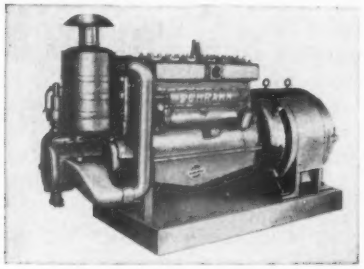
47
FOOD CART brings the rest-period snack to the worker at his machine. Made of stainless steel, the carts are available with or without heating elements in the food compartments. Although primarily designed for "time-out" snacks, the cart can also be used for lunch-hour service. *Anetsberger Bros.*

48
ELECTRIC HUMIDIFIER for heavy duty requires no duct-work or air outlets for its installation. All that is needed is an electric outlet. The manufacturer says the dehumidifier will retail for about

For more about these products, circle item numbers on Reader Service card next to back cover.

NEW SUPER-*Unistage* Air Compressor Offers Many Advantages

Schramm, Inc., makers of air compressors for 54 years, announces the newest in its line — a 600 c.f.m. industrial model, the Super-*Unistage*. Major advantage of this compact, vibrationless unit is its super-charge design, which puts it in a class all by itself and answers the industry's demand for such a model.



Noteworthy advantages are offered by the Super-*Unistage*. For here has been designed a large capacity compressor which at the same time is compact, vibrationless, adaptable to the unit-system installation whereby multiple power can be provided by operating the series of units, or a single or several units when peak air loads are not required.

Tailor-Made for Economy, Larger Air Capacity

Before purchasing any air compressor, it is quite natural to investigate its purchase price, maintenance, upkeep and installation costs. Here, in one package, you have the answer to your search for economy.

Its price is in keeping with the air it supplies . . . there is practically no installation cost since no elaborate foundation is required . . . and its maintenance is low.

Features

The Schramm Super-*Unistage* is a 150 h.p. six cylinder model having mechanically operated intake valves with the patented Schramm intake valve unloaders, large diameter cushioned low lift discharge valves, seven main bearing crankshaft with pressure lubrication to all bearings.

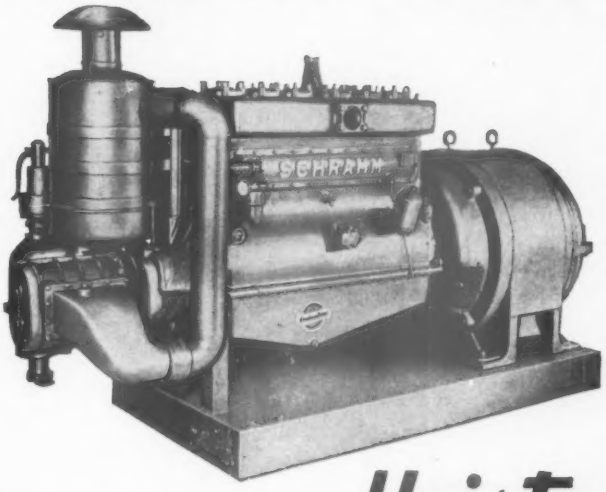
The unit is available with either an intercooler of a tubular type heat exchanger, with the water passing from the intercooler through the compressor jackets (as shown in illustration) or with the Schramm cooling unit, radiator type, in which the intercooler is an air-cooled unit with fan.

The model illustrated has 440 volt, 3 phase, 60 cycle, low starting current, normal torque, induction motor. Also, 208, 220 or 550 volt induction motors are available at the same price.

Other features make the unit notable.

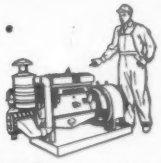
SCHRAMM, INC., THE COMPRESSOR PEOPLE, WEST CHESTER, PENNA.

Here It Is . . .
The Air Compressor You Asked for

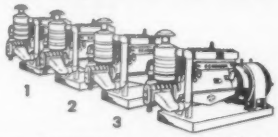


SCHRAMM SUPER-*Unistage*

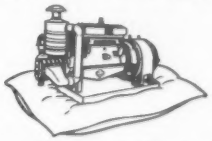
A Super-Charged 600 c.f.m. Air Compressor Designed to meet your Compressor needs for . . .



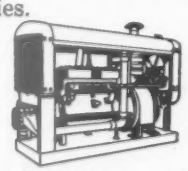
COMPACTNESS . . . requires less floor space than other models.



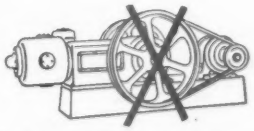
UNIT SYSTEM . . . Installed as a series, provides air as the air need varies.



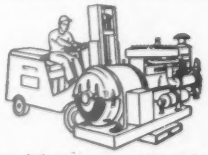
VIBRATIONLESS . . . Perfect balance of all moving parts.



COMPLETE PACKAGE . . . No extras — everything one unit!



NO ELABORATE FOUNDATION . . . sturdy floor needed — that's all!



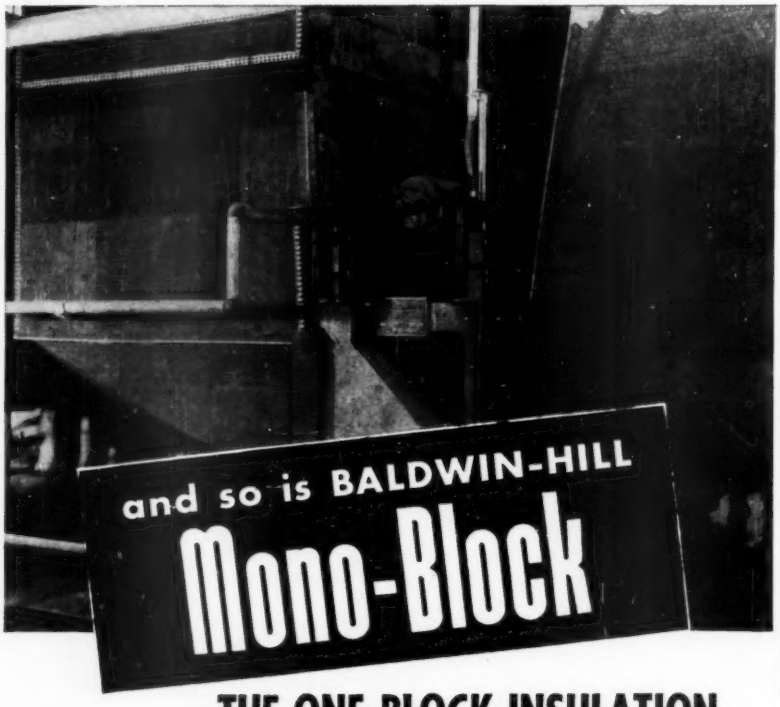
EASY TO MOVE . . . air where you need it — and want *it!*

Get full details on this new, exciting 600 c.f.m. air compressor today. Bulletin 5313 is now available. Write for your free copy.

SCHRAMM, INC.

The Compressor People • WEST CHESTER • PENNSYLVANIA

FACTORY is a problem solver

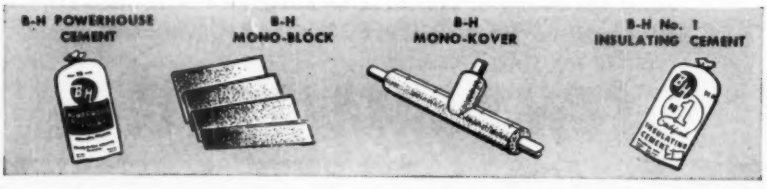


THE ONE-BLOCK INSULATION FOR TEMPERATURES UP TO 1700°F

- One Block application instead of two.
- Light in weight, easily cut with a knife to fit odd shapes.
- Impales over studs, clips, or wires.
- Low thermal conductivity because of unique felted structure.
- Forms strong bond with insulating cements.

Baldwin-Hill COMPANY
506 BREUNIG AVE., TRENTON, N. J.
Kalamazoo, Mich. • Huntington, Ind. • Temple, Tex.

Send for bulletin with data on composition, properties, efficiency and low applied cost.



half the cost of conventional types of equipment of equal capacity. Unit can be placed over a drain, or a pail may be used for water collection. Caster mountings for mobility are optional. *Remington Corp.*

49
WIRE-TWISTING TOOL can twist two wire ends together three times faster than the old hand method, maker says. It is actually three tools in one—pliers, wire cutter, and twister. All you do to twist wire ends is place them in the pliers, lock the handles by slipping down the center rod, and then pull the knob on the end of the tool. *Ralph C. Robinson Co.*

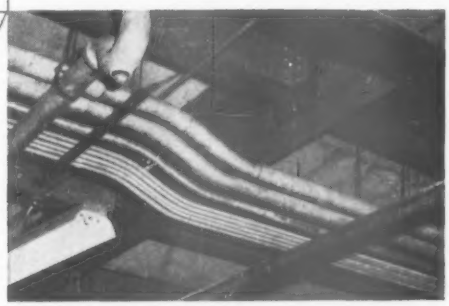
50
SHEET WORKING MACHINE will do beading, straight cutting, folding, joggling, circular cutting, slot cutting, and irregular or free-hand cutting. Tools can be changed easily and quickly, says maker. Mechanism is enclosed and operated in oil bath. *Eric S. Johnson Co.*

51
MAGNETIC SWEEPER removes nails, tacks and other tramp iron from factory aisles, roads, and parking lots. Super-Sweeper comes with a removable frame and wheels, so it can be used on a fork truck. The sweeper is offered in 3-strength magnets and in widths from 24 to 60 inches. *Eriez Mfg. Co.*

52
ELECTRIC SEWER CLEANER is able to clear obstructions 100 feet from the sewer entrance. The cutting tools attached to the end of the snake can remove roots, grease, chips, and other objects from the pipes. Snakes and tools can be rotated in either direction. *Oster Mfg. Co.*

53
VISUAL ALARM UNIT, called Mono-alarm, requires only a small space on a panelboard. It was developed

For more about these products, circle item numbers on Reader Service card next to back cover.



a complete SPANG® CW STEEL PIPE installation

With 85 years' experience in the brewing business, Ortlieb Brewing Company, Philadelphia, knows what it takes to turn out quality beer and ale. Ortlieb brewers know that in order to make *top-quality* beverages you need *top-quality* ingredients.

The architects and contractors who constructed Ortlieb's new bottling house know that a building, too, is only as good as the materials which go into it. That's why they specified *top-quality* Spang CW Steel Pipe to handle the heating, plumbing and drainage for the new plant.

Like the products it serves, Spang CW Steel Pipe is a *quality* product . . . made from the highest-grade skelp . . . carefully controlled and inspected throughout production . . . and thoroughly tested before shipment. This care in manufacture assures you a product which is easy to cut, thread and bend . . . saving you valuable installation time and money.

Top-quality Spang CW Steel Pipe is available at no extra cost. Don't just buy pipe . . . buy Spang CW Steel Pipe for your next installation.

Write for complete information and for the name of your nearest Spang Distributor.

Owner: Henry F. Ortlieb Brewing Co., Philadelphia, Pa.
Architect, General Contractor and Piping Contractor: W. F. Koelle Co., Philadelphia, Pa.
Spang Distributor: H. B. Pancoast Co., Philadelphia, Pa.

SPANG

SPANG-CHALFANT
DIVISION OF THE NATIONAL SUPPLY COMPANY
General Sales Office: Two Gateway Center, Pittsburgh, Pennsylvania. District Sales Offices: Atlanta, Boston, Detroit, Houston, Los Angeles, New York, Philadelphia, Pittsburgh, St. Louis.

STOP VIBRATION

with

KORFUND VIBRATION CONTROL

At the ***Western Electric*** Kearney, N. J. works, six of these Bliss High Production Presses are stamping precision parts for telephone switchboards. Even at speeds up to 300 s.p.m., tolerances are held within .002" in progressive dies. Korfund Vibro Isolators are used as mountings for these presses which are located on both the ground and second floors in a blanking area. The mountings were installed to reduce the possibility of cumulative rhythmic vibration which might adversely affect the performance of any or all of the machines in the area; also to reduce noise between floors.

Korfund Vibration Control has paid off in dollars and cents for thousands of manufacturers, because Korfund units reduce transmitted vibration and:

- Permit more efficient plant layouts
- Decrease original building and foundation costs
- Permit installations without reinforcement of floors
- Reduce rejects, improve work quality
- Reduce maintenance costs
- Lengthen building and machine life
- Increase machine speed and production
- Insure quieter unit operation—less operator fatigue

We'll gladly send more information on Korfund Vibration Control for presses, machine tools, hammers, compressors, and other mechanical equipment. Write today for your free copy of Bulletin #1, or see our catalog in Sweet's Files.

For specific recommendations, contact us or your local Korfund office. A half century of experience is at your disposal.

KORFUND VIBRATION CONTROL — SPRINGS — RUBBER — CORK

THE KORFUND CO., INC.

48-35C Thirty Second Place, Long Island City 1, N. Y.
In Canada: 510 Canal Bank, Ville St. Pierre, Montreal

Begins on page D-56

for flow lines and graphic panels to provide a visual check on processes without bulky signal-alarm units, maker says. When everything is running smoothly, the "normal" light shines. When trouble occurs, the "alarm" light flashes. *Russell & Stoll Co., Inc.*

54
MAINTENANCE CLEANER is designed for one-man use in wet and dry pick-up operations, as well as in furnace cleaning. The Vacu-Master has one motor to provide 56-in. water lift and another motor to ventilate the power unit and keep it free of water and dirt. *Empire Chemical Products Co.*

55
FALSE BOTTOM suspended by tension springs keeps work at rim-level of canvas hampers and baskets. Called Automatic Lift. Bottom descends as work is loaded into the basket and rises as work is removed. Designed to reduce worker fatigue by eliminating the need for reaching into the container. *W. T. Lane & Bros., Inc.*

56
POWER SWEEPER turns on a dime and can dump load weighing up to 700 pounds in 30 seconds. Operated by one man, it drives like a car and covers a 36-in.-wide path, picking up dirt, litter, and dust. Travels at speeds up to 6 mph. *G. H. Tennant Co.*

57
GAS-FIRED UNIT HEATER features all-welded, aluminized steel combustion chamber and heat exchanger capable of withstanding the corrosive effects of gases, says maker. Aluminized steel will not discolor at temperatures up to 900 F. and will not scale until heat exceeds 1600 F. Available in seven sizes. *Young Radiator Co.*

58
QUICK-OPENING DOOR for pressure vessels is an improvement over the old nut-and-bolt type of door.

Turn the page

For more about these products, circle item numbers on Reader Service card next to back cover.

AIR CONDITION YOUR FACTORY

The KRITZER Way

Manufacturers Agents
WRITE FOR DETAILS

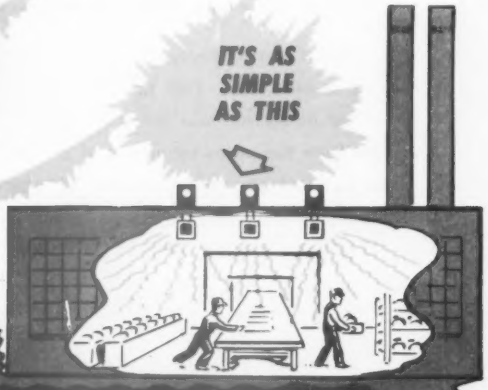
● You require no central system — you have no network of pipes — no water nor drain connections BUT you do cover the "hot spots" with a blanket of mechanically refrigerated air. It's all so simple, so effective, dependable, and economical. Because KRITZER units are individually installed, you have true flexibility — you can place and re-place the units to meet every need for expansion or contraction of space or personnel.

You begin air conditioning at low cost and you continue it at low cost. Purchase only the number determined by your budget. Add units over any period of time as required.

The two horsepower Freon Compressor and Condenser are mounted on the roof — any type — of your structure. Refrigerant is circulated through two supporting stanchions to evaporators hanging below the roof. The cooling is performed from this hanging "unit cooler" by means of a fan blowing the air over the suspended aluminum and copper evaporator coil. The hermetically sealed compressor carries a five-year warranty.

Individual Units placed as required give you complete mechanically refrigerated
AIR CONDITIONING
in all areas where installed

IT'S AS SIMPLE AS THIS



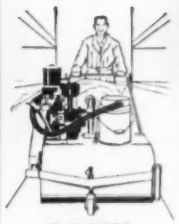
KRITZER PRODUCTS Chicago

Sold only factory to you

Send us blueprint or sketch of your factory layout. Give number of employees, "hot spots," hot process areas, etc. We will make recommendations and quote prices F.O.B. factory per unit. Save from one-third to one-half the cost of a "central system" with KRITZER units.

KRITZER PRODUCTS

1234 W. LE MOYNE ST. • CHICAGO 22, ILLINOIS



IT SWEEPS
20,000 to 30,000 sq. ft. per hr.

IT DUSTS
Picks up or blows down in hard-to-get-at-places

. . . the ONE-MAN Clean-up Crew

it's your WILSHIRE 3-WAY maintainer

IT BLOWS DOWN
Removes chips and dust from machines

IT PICKS UP
Reaches under machines and benches, into corners

NOW!

At last . . . the *complete* clean-up machine . . . the WILSHIRE 3-Way Maintainer . . . the most versatile clean-up machine ever developed. It's tested, proved and ready to give you years of dependable, economical service.

WILSHIRE, the largest exclusive manufacturer of industrial power sweepers, has concentrated a decade of experience on designing and building better sweepers. As a result, WILSHIRE is accepted as the standard of quality in design and performance by maintenance men when competitive specifications are submitted.

Wilshire POWER SWEEPERS
SWEEPING THE COUNTRY

Your profits for '54 will depend on savings you can effect in operations and maintenance. Put a WILSHIRE Power Sweeper to work for you and start saving now. Write for data on Wilshire money-saving performance, and the name of your nearest WILSHIRE Distributor.

WILSHIRE POWER SWEEPER COMPANY
526 W. CHEVY CHASE DRIVE • GLENDALE 4, CALIFORNIA
IN CANADA: PLANT MAINTENANCE EQUIPMENT CO.—VANCOUVER—TORONTO—MONTREAL

HANDEEZ

THE HAND CLEANING COMPOUND THAT REMOVES GROUND-IN GRIME GENTLY AND SAFELY

Shop grime works deeply into pores . . . its residue is a contributory factor in dermatitis. Tiny skin cuts caused by harsh abrasives are entering points for skin infections. HANDEEZ *lifts* hard-to-remove grime from the pores by means of a sterilized vegetable emollient. The result: clean, smooth skin, even where cutting oils and other stubborn shop grime are present.

HANDEEZ is ideal for both shop and office use.

Write for literature, or see your Dolge Service Man.

FOR
FREE SANITARY SURVEY
OF YOUR PREMISES
SEE YOUR DOLGE SERVICE MAN

Dependable DOLGE
WESTPORT, CONNECTICUT

Can be opened or closed in a few seconds by expanding or contracting a split ring. Should find many applications in the rubber and glass industries, or wherever pressure units are employed. *Blaw-Knox Co.*

59
SELF-CLEANING STRAINER is designed to remove fine suspended particles from raw and process water, then dispose of them automatically. When the accumulation of foreign matter passes a predetermined limit, the strainer flow reverses. This flushes the waste from the strainer elements. *S. P. Kinney Engineers, Inc.*

60
WATER-SAVING DEVICE has time setting. Just set the timer and the water will be automatically shut off at the desired time. Can be used for other light liquids as well as water. Should save time and labor. *Flo-Matic Valve Co.*

61
ELECTRONIC DEODORIZER is designed to banish odors, smoke, mustiness. Relatively inexpensive, it employs an ozone lamp. The 4-watt lamp is enclosed in a chrome wall fixture. It can be plugged into any 110/125-volt a-c circuit. *General Mfg. & Distributing Co.*

62
PLASTIC-COATED BLANKET is designed to smother fires quickly. Made of vinyl-coated glass cloth. Can be thrown over a person or small machine to cut off the oxygen. The 60x76-in. blanket weighs only 2½ pounds. *Standard Safety Equipment Co.*

63
PLASTIC SAFETY GLASSES can be adjusted to fit each worker's requirements. The plastic temples telescope in or out to any length desired. This adjustable feature eliminates the need for stocking many different sizes of glass frames. Once adjusted by the

Turn to page 84

For more about these products, circle item numbers on Reader Service card next to back cover.

"Here's a goggle I *like* to wear!"

Who's speaking? Any worker who's ever worn USSSCO's amazing lightweight **SAF-I-FLEX** cover goggle. They like it for four reasons:

(1) TRUE COMFORT –
actually weighs less than 2 ounces . . . soft, flexible, frame has wide-rolled edge.

(2) BETTER FIT –
fits any face contour . . . fits over personal glasses, too.

(3) CLEARER VISION –
crystal-clear vinyl frame . . . grid vents eliminate fogging.

(4) SURE PROTECTION –
rugged, optically correct OPTILITE® lens . . . meets all federal specs. — easily replaced.

Working for You to Make Safety Work

NOW! *A Complete Line of Head and Eye Protection for Every Job!*

UNITED STATES SAFETY SERVICE CO.

KANSAS CITY 6, MISSOURI

BRANCHES IN PRINCIPAL INDUSTRIAL CITIES

IN CANADA: PARMELEE, LTD., TORONTO & MONTREAL

"How modern coal equipment saves us $9,000 a year and solves our smoke problem!"

Says Albert E. Unruh,
Chief Engineer
University of Detroit
Detroit, Michigan

This is a smokestack. This beautiful War Memorial Tower actually conceals the smokestack for the U. of Detroit's steam plant. Though it's in the very center of the campus, there's never any smoke problem, thanks to a modern coal-fired power plant.

"Again and again over the last decade, coal burned with modern equipment has proved itself the most flexible, economical fuel for heating our school buildings. We made our first investment in modern coal equipment shortly after the last war. By 'restokering' two existing boilers, we saved $9,000 the first year—actually $2,500 more than we estimated. At the same time, we solved a disturbing smoke and flyash problem and provided enough steam capacity to heat additional new buildings.

"We're completely sold on coal. And when our building expansion program required us to further increase steam production, we again chose a modern coal-fired boiler. Coal has proved its ability to handle increased loads and save us dollars year after year. And modern equipment eliminates smoke nuisance."

Additional case histories, showing how other types of plants have saved money by burning coal with modern equipment, are available upon request.

If you operate a steam plant, you can't afford to ignore these facts!

BITUMINOUS COAL in most places is today's lowest-cost fuel, and coal reserves in America are adequate for *hundreds of years to come.*

COAL production in the U.S.A. is highly mechanized and by far the most efficient in the world.

COAL prices will therefore remain the most stable of all fuels.

COAL is the safest fuel to store and use.

COAL is the fuel that industry counts on more and more—for with modern combustion and handling equipment, the inherent advantages of well-prepared coal net even bigger savings.

If you want to cut steam costs, it will pay you to investigate the advantages of modern coal equipment. For example, you may be able to save as much as 20% on fuel alone by replacing outdated equipment with modern stokers and boilers. Or, a small investment in modern controls and other up-to-date, fuel-conserving devices may boost efficiency of your present operation.

You can save on labor, too, by installing modern handling equipment. Modern coal-feeding and ash-removal systems can eliminate practically all hand labor.

Call in a consulting engineer. He can give advice on what equipment best fills your specific needs. And his recommendations may save you dollars year after year.

BITUMINOUS COAL INSTITUTE
A Department of National Coal Association
Southern Building, Washington 5, D. C.

FOR HIGH EFFICIENCY ... FOR LOW COST

YOU CAN COUNT ON COAL!

On his feet all day and feeling fine... U. S. Rubber Foot-Ease Matting does it!

Standing continuously on hard floors fatigues and slows down *3 out of 4 workers*. Resultant foot trouble costs management hundreds of millions of dollars a year in lost man-hours. United States Rubber Company engineers tackled this problem and developed U. S. Foot-Ease Matting. Made of tough, durable rubber compound backed up by springy sponge rubber. U. S. Foot-Ease "cushions" the feet from the floor, relieves strain on leg and foot muscles, eliminates "aching arches."

U. S. Foot-Ease provides *sure footing* and is available in a special ribbed pattern or a pyramid surface design. It can easily be cut to any desired dimensions from 25-yard rolls of 36-inch width. Available at any of our selected distributors or call one of our 25 District Sales Offices, or write to address below.

Enlarged section (above, left) shows the ribbed design of U. S. Foot-Ease matting upon which both workers are standing.

"U. S." Research perfects it
"U. S." Production builds it
U. S. Industry depends on it

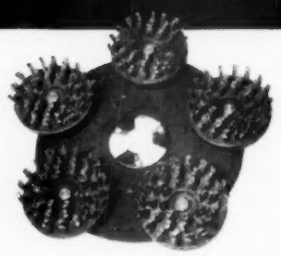
US RUBBER

UNITED STATES RUBBER COMPANY
MECHANICAL GOODS DIVISION · ROCKEFELLER CENTER, NEW YORK 20, N. Y.

Hose • Belting • Expansion Joints • Rubber-to-metal Products • Oil Field Specialties • Plastic Pipe and Fittings • Grinding Wheels • Packings • Tapes Molded and Extruded Rubber and Plastic Products • Protective Linings and Coatings • Conductive Rubber • Adhesives • Roll Coverings • Mats and Matting

CUT GREASE AND LABOR COSTS

Dry-scrubbing floors with multiple brush removes heavy grease; no wet scrubbing needed



Kent's new K-22 heavy-duty floor machine has the rugged capacity to cover a 22-inch width of floor section with every sweep of the machine. Heavy grease accumulations can be *dry-scrubbed* with the special multiple brush illustrated here — although the machine can also be used for wet scrubbing when needed. This special brush is self-cleaning and self-sharpening; five individual brush units are mounted on ball bearings.

Kent floor machines pay for themselves by saving hundreds of man-hours annually when compared with hand methods — a fact proved in actual usage tests. Kent's exclusive Offset Design and many other Kent features permit faster and better work . . . cause less fatigue . . . and reduce maintenance costs.

- **OFFSET MOTOR DESIGN** minimizes torque, counter-balances handle weight for faster, better work.
- **FLOATING POWER . . .** cushioned gears withstand shock . . . power flows smoothly.
- **FULLY ENCLOSED MOTOR** dust and waterproof, reduces motor maintenance.
- **SEALED GEAR CHAMBER** — positive lubrication for all moving parts, cuts maintenance.

KENT

PIONEER IN MAINTENANCE EQUIPMENT SINCE 1913

KENT'S EXCLUSIVE OFFSET DESIGN IS THE KEY

KENT CO., INC., 456 Canal St., Rome, N.Y.

Send immediately complete facts on Kent Floor Machines that cut grease and labor costs, also send information on Industrial Vacuum Cleaners.

Firm Name.....

My Name.....

Address.....

City.....State.....

worker to proper length, temples remain in place. *Watchemoket Optical Co., Inc.*

64

PIPE INSULATION snaps into place. Made of one-piece molded glass fiber. Has the following properties: exceptional thermal efficiency, light weight, flexibility, resilience, is non-breakable, insoluble in water, readily cut to length, and can be painted. Available in 6-ft. lengths for pipes ½ to 10 inches in diameter. *Gustin-Bacon Mfg. Co.*

65

OIL BASE MASONRY PAINT for the protection of interior as well as exterior surfaces against moisture penetration is called Cind R Seal. It's a flexible coating that conforms with the normal expansion and contraction of masonry. *Ohio Paint & Color Co.*

66

FLEXIBLE COOLANT TUBE made of neoprene, can be twisted into almost any shape. And it remains twisted until re-shaped. Copper core keeps tube from sagging, drooping, or wandering out of position. *Acrobat Co.*

67

PIPE IDENTIFICATION system requires no protective coating, cleaning, or maintenance. It uses labels custom-made of vinylite plastic sheet. The labels spring closed over the pipe. They are colored and worded to suit requirements. Available to fit any size pipe up to 30 inches in diameter. *Wilmington Plastics, Inc.*

68

PLASTIC VALVE SHIELD is easy to install and withstands most acids and corrosive conditions. Transparency allows instant detection of leaks, too. Hand wheel need not be removed to install shield. Can be re-used time after time in different locations. *Wilmington Plastics, Inc.*

Turn the page

For more about these products, circle item numbers on Reader Service card next to back cover.

when work orders say,
Rush this!
and the boss says,
Save Money!

choose
GARDNER-DENVER
maintenance tools

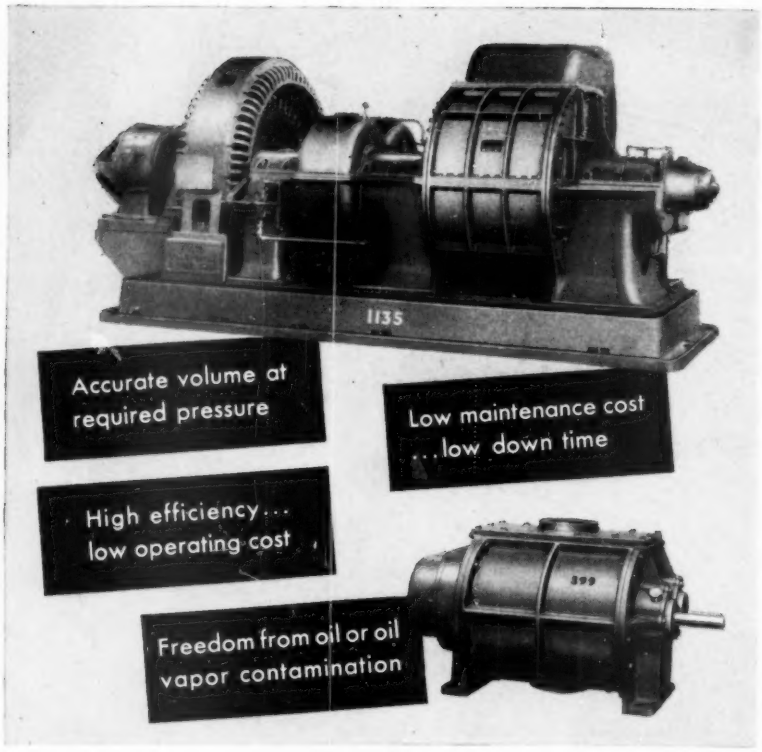
Paving Breakers
Backfill Tampers
Sheeting Drivers
Utility Drills
Rock Drills
Trench Diggers
Air Hoists
Clay Spaders
Portable Compressors
Line Oilers
Sump Pumps

choose
GARDNER-DENVER
air motors

for smooth, safe, flexible power. Bulletin AM-1.

Send for our new Bulletins on Paving Breakers and Air Tools.

GARDNER-DENVER


Accurate volume at required pressure
Low maintenance cost ...low down time
High efficiency... low operating cost
Freedom from oil or oil vapor contamination

LOOK FOR THE "BIG 4"

WHEN YOU BUY BLOWERS

Successful over-all performance of blowers calls for continuous, long-time ability to meet these basic requirements. In any specific case, one may be more important than another. But, when you select Roots-Connersville equipment, you sacrifice none of these four essentials. That is true, whether your requirements are for a whisper of air or for a tornado. You'll find the R-C range of capacities so extensive that you can very closely match your needs, with resulting economies in both first cost and operating cost. Further, you have the choice of either Rotary Positive or Centrifugal Blowers, from the exclusive R-C *dual-ability* line.

The ability to deliver blowers with these fundamental values comes from our century of specializing in problems of handling gas and air. The proof of this ability is readily found in our list of long-time customers who have gained complete satisfaction by entrusting their blower problems to Roots-Connersville. Ask us about your present or future needs in equipment to handle gas or air.

ROOTS-CONNERSVILLE BLOWER

Reg. U.S. Pat. Off.

A DIVISION OF DRESSER INDUSTRIES, INC.
654 Central Ave. • Connersville, Indiana

Specialists in handling gas and air

EQUIPMENT REVIEW

Begins on page D-56

69
PORTABLE OIL FILTER can be used wherever oils need cleaning. Operates on a recirculation basis until oil is fully reconditioned. Flexible hose with quick-connecting couplings permits machine hookup without interrupting operations, maker says. Can be moved quickly and easily. *U. S. Hoffman Machinery Corp.*

70
ELECTRONIC RELAY is highly sensitive to resistance changes and can be varied by a stepless dial. Stops and starts a fractional horsepower motor directly by instruments. When the contact-making ammeter, voltmeter, or watt meter reaches the required reading, it immediately sets off the relay. *General Electric Co*

71
FLOOR MAINTAINER suits all types of floors and can do many maintenance jobs. The basic machine can be quickly adapted with accessory brushes and pads to perform scrubbing, waxing, polishing, shampooing, buffing, drycleaning, grinding, and sanding operations, manufacturer says. *Premier Co.*

72
STEAM HEATER of lead-plate type is for use in the chemical and processing industries. Maker recommends use of 10 pounds of steam or less. The heaters, formerly made of steel, are compact, strong, and provide largest practical square footage of heating area in smallest possible volume. *Knapp Mills, Inc.*

73
AUTOMATIC LUBRICATION system will deliver lubricant to as many as 36 individual points, regardless of pressure differences. Flow rate per feed ranges from 2.3 cubic inches per hour to less than 1 cubic inch per 700 hours. Can use lubricants from light oils to light greases. *Nathan Mfg. Corp.*

Turn the page

For more about these products, circle item numbers on Reader Service card next to back cover.

Conditioned air maintains peak efficiency in portable tool plant

. . . HOLDS TOLERANCES UP TO .0003 EVEN ON SCORCHING DAYS

Pneumatic tool center blocks, made of magnesium with cast-in steel inserts for bearings, are extremely sensitive to temperature changes. It is absolutely necessary for an operator in honing them to make certain, as above, that close tolerances up to .0003 be held at all times.

To meet this challenge of contracting and expanding metals . . . the *Rotor Tool Co., Cleveland, Ohio,* turned to air conditioning. Their recently constructed plant, occupying over an acre of ground, is fully air conditioned, and a temperature of 75°F. is now rigidly maintained the year around.

This constant temperature has led to many economies. Efficiency jumped five per cent. Peak production is readily held even during summer's hot, muggy days when partly air conditioned shops either close down entirely or suffer a severe lag. And yet, the cost involved for this improvement amounts to less than one per cent of labor and overhead combined!

A central cooling plant consisting of a *Worthington* reciprocating-type compressor cools 32,000 sq. ft. of Rotor's main plant, while two compact "package units" provide comfort for office personnel. All three installations operate with Du Pont "Freon"* fluorinated hydrocarbon refrigerants . . . ideal for *all* industrial applications because they are safe . . . nonflammable, nonexplosive and virtually nontoxic.

Discuss the subject of air conditioning (and refrigeration) with your own engineers—now. It's quite possible that both may be put to profitable use within your own plant or offices. Surely it's worth looking into.

A booklet: *"How Air Conditioning and Refrigeration Benefit Industry"* will be sent upon request. E. I. du Pont de Nemours & Co. (Inc.), "Kinetic" Chemicals Div., Wilmington 98, Del.

KINETIC

FREON

REG. U.S. PAT. OFF.

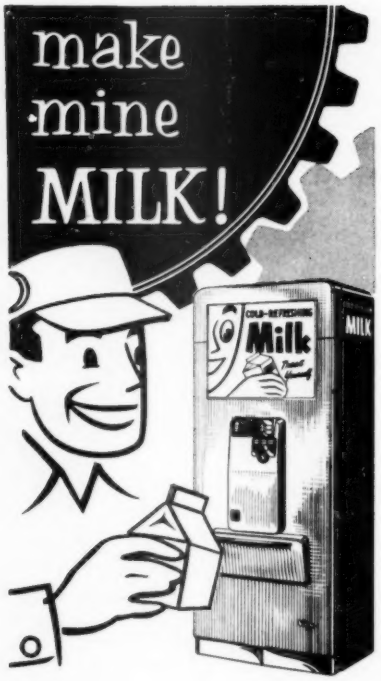
SAFE REFRIGERANTS

**"Freon" is Du Pont's registered trade-mark for its fluorinated hydrocarbon refrigerants.*

DU PONT

REG. U.S. PAT. OFF.

BETTER THINGS FOR BETTER LIVING
. . . THROUGH CHEMISTRY



Workers *Like* Milk!

MILK is the wholesome refreshment — delicious, nutritious and satisfying.

You can now bring individual sealed cartons of cold-refreshing milk to the employees in your plant or office with the new **Dairy-Vend Milk Vender**. It not only makes rest periods more enjoyable, but provides the best method of serving milk at lunch.

Dairy-Vend Milk Vender sells, serves and collects for each sale automatically. It takes so little floor space — just 18 inches deep by 32½ inches wide. **And it pays its own way.**

Act now! Make refreshment an asset to your company by providing **Dairy-Vend Milk Vender** service.

Send today for free folder and details on how easy you can arrange for this milk service.

THE VENDO COMPANY
Dept. FM-6, 7400 E. 12 St., Kansas City 26, Mo.

Please send me information regarding Dairy-Vend Milk Vender service. No obligation.

Name_____
Title_____
Firm_____
Address_____
City_____ State_____

EQUIPMENT REVIEW

Begins on page D-56

74
PIPE BENDING MACHINE can be carried by hand from work area to work area. Power for bending is supplied by a ¾-hp. motor. It will bend from ½ to 1¼ inches. IPS up to 180 degrees. One man can do an average of 60 bends per hour with this machine, maker says. Limit switches to avoid over-travel are factory-set. *Wallace Supplies Mfg. Co.*

75
POWER SWEEPER is designed for cleaning large floor areas, sidewalks, and parking lots. Maker says it's fast and economical to operate, and will even pick up shavings. One man can empty the all-metal hopper that snaps on in front of the brush. *Eshelman Co.*

76
HOT-DRINK SERVER is capable of serving eight different drinks simultaneously. Holds ingredients for 1700 servings and has a 600-cup capacity. Electrically operated, it has many sanitary precautions. *King Mfg. Co.*

77
HUMIDIFIER automatically maintains desired moisture content in an area of at least 15,000 cubic feet. Operating at the slightest change in atmospheric conditions, it will maintain humidity within a variation of approximately 1%, maker says. Even circulation of air throughout the entire area is assured by propeller-type fan. *Southworth Machine Co.*

78
FILTERING MATERIAL of glass fiber is available in unformed pads cut to size and rolls. This will eliminate the need of heating and air conditioning equipment to design units for standard-size air filters. Material can be bent, squeezed, or shaped without losing its filtering properties. Can be held in place without pad retainer or other devices, manufacturer says. *American Filter Air Co.*

Turn the page

For more about these products, circle item numbers on Reader Service card next to back cover.

PANGBORN BLASTS
by don herold

COST-CUTTING STORY OF THE PANGBORN BLAST CLEANING MACHINE

It removes scale, rust, dirt and paint as easy as pie
-cleans bridges, tanks, buildings, hulls, structural metal, sheets and plates, like magic

Pangborn Blast Cleaning Machine — available in six types, stationary or portable—delivers efficient, low cost maintenance in any plant. $188 up.

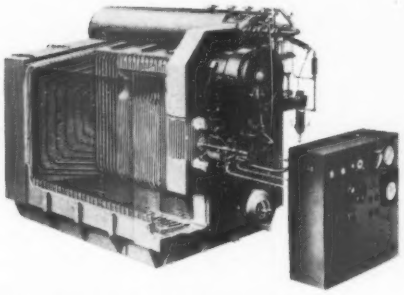
For details, write: PANGBORN CORP., 2100 Pangborn Blvd., Hagerstown, Maryland.

Pangborn

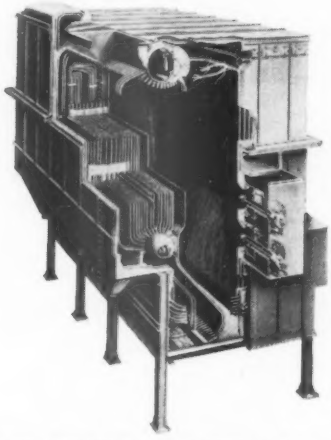
BLAST CLEANS CHEAPER
with the right equipment for every job

PANGBORN'S 50th ANNIVERSARY, 1904-1954

For High Steam Efficiency at Lower Cost



FM— —2,900-30,000 lb/hr up to 250 psi. Oil and Gas Firing.



FH— —50,000-350,000 lb/hr up to 1050 psi. Pulverized Coal, Oil, and Gas Firing.

CHOOSE THE B&W BOILER THAT MEETS YOUR NEEDS

- **The FM**
- **The FH**
- **The Stirling 2-Drum**

Little to big: from the FM's 2900 lb per hr to the FH's 350,000 lb per hr, and in between, B&W offers you a choice of boilers that meet a wide and unusual range of requirements.

Today, these and other B&W boilers are supplying industry with well over 200,000,000 lbs of steam per hr; proof that long service life and low operating and maintenance costs gain wide acceptance and will do the job wherever overall cost is a problem.

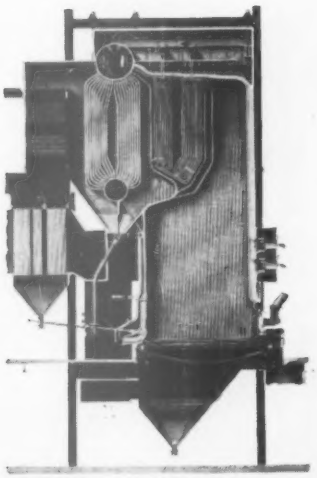
Before planning your next installation, check with B&W for the boiler best suited to your needs. These units are available for all standard fuels, and B&W can also meet your requirements should conditions demand the use of special fuels. Write for illustrated bulletins covering the B&W "F" Boilers in greater detail. The Babcock & Wilcox Company, Boiler Division, 161 East 42nd Street, New York 17, N. Y.

COST SAVING FEATURES

- Minimum floor space and headroom requirements.
- High fuel economy.
- Smokeless combustion.
- Adaptable to all fuels and firing methods.
- Economical fast steaming.
- Water-cooled furnace.
- Clean, dry steam at all ratings even with high boiler water concentrations.
- Quick response to wide and heavy load swing demands.
- Easy to inspect and clean.
- High availability with least attention.

BOILER DIVISION **BABCOCK & WILCOX**

G-655



Stirling 2-Drum— —Capacities to 250,000 lb/hr. Coal, Oil, and Gas Firing.

VALDURA

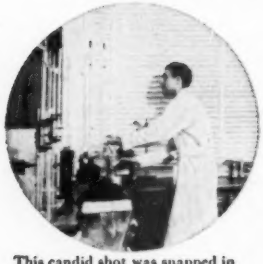
TANK-WHITE

was specified for this job because...

National Petro Chemical Co.
Tuscola, Illinois

PERFORMANCE and DURABILITY

have been *double*-tested...in the laboratory...and on countless jobs.



This candid shot was snapped in Valdura's newly completed laboratory in Kankakee, Ill.

Names of important users of Valdura products will be gladly supplied upon request.

VALDURA TANK-WHITE . . . and every other product in Valdura's complete line of heavy-duty industrial maintenance paints . . . is the product of thorough research in ultra-modern laboratories staffed by hundreds of the finest technicians in the industry.

Your added dividend, when you buy a Valdura product, is that it's

JOB TESTED!

Valdura's years of experience as the leader in the field of heavy-duty industrial maintenance paints, provide case record after case record to prove the efficiency and economy of its products.

If you'd like to know more about Valdura's complete line of specialized maintenance products, or if you'd like help with a particular problem, just state your wishes on your regular letterhead and mail to the address below. Your inquiry will be treated as an invitation to provide service . . . not as a license to exert selling pressure!

VALDURA PAINTS THAT ENDURE

VALDURA HEAVY DUTY PAINT DIVISION

AMERICAN-MARIETTA CO.

101 E. Ontario St., Chicago 11, Ill.

EQUIPMENT REVIEW

Begins on page D-56

79

POWER SWEEPER can be pushed by anything that moves—fork truck, motor truck, tractor, or jeep. Special clamps for mounting are available. Can be attached or removed from vehicle in 3 minutes, says maker. Has a 9-cu.-ft. collection hopper and a 25-gal. sprinkler system for dust control. *Little Giant Products, Inc.*

80

ALL-PURPOSE VENTILATORS covering a wide range of capacities have been announced. Consist of fan, motor, and drive in a single package. Series 900 has six models to handle air volumes from 200 to 3200 cfm. Series 1000 has capacities from 375 to 14,400 cfm. *Westinghouse Electric Corp.*

81

SCAFFOLD ATTACHMENT for use on Lewis - Shepard electric fork trucks has been marketed. Truck's forks slip into sleeves to hold scaffold securely. A ladder built into one side of the structure allows easy access to the platform, maker says. Has remote control so maintenance worker can raise and lower himself. *Lewis-Shepard Products, Inc.*

82

AIR COMPRESSOR for medium-size paint jobs is dolly-mounted. Offers economical and efficient operation for spraying lacquer synthetic enamels and ordinary paints, maker says. Has a ¼-hp., 115-volt motor and a 7-gal. welded steel tank. *Pariser Machinery Co., Inc.*

83

DUST COLLECTOR separates dust from air by centrifugal force. By removing nuisance, toxic, and hazardous dust it will reduce maintenance, maintain more healthy working conditions. This equipment is economical to install. Will not handle gases with temperatures exceeding 800 F. *A. W. Banister Co.*

Turn the page

For more about these products, circle item numbers on Reader Service card next to back cover.

NO EXTRA COST FOR U-COTE PROTECTION!

ON BLACK FITTINGS

U-Coted fittings resist rust and corrosion and only Union Malleable can offer this exclusive protective coating. Actual laboratory tests have proved that U-Coted fittings protect against fumes, acids, alkalies, steam, water, soot, smoke, soap, rust, electrolysis, abrasion, wear, sun, heat, oxidization, corrosion Ask for U-brand fittings and remember—you get the extra advantages of U-Cote at no additional cost.

A Complete Line of Galvanized and Black Malleable, Copper, Sweat and Cast Iron Drainage Fittings, Nipples and Unions Distributed Through Wholesalers All Over the World

The **UNION MALLEABLE MANUFACTURING CO.**

ASHLAND, OHIO, U.S.A.

This cafeteria kitchen was resurfaced with special SURCO without moving tables, stoves or sinks. Food spillage and caustic cleaning agents extensively pitted the original concrete. Present SURCO floor is highly chemical resistant, nonskid, and its resiliency reduces fatigue of kitchen help who must remain standing for long periods.

SURCO FLOORS

Pass the Acid Test!

Concrete floors deteriorate rapidly in plant cafeteria kitchens due to destructive acids present in vegetable and meat juices. Special SURCO floors have high chemical resistance, eliminating this problem.

SURCO bonds permanently to concrete, wood, metal, even glass. It is applied right over concrete in a thickness of only ¼ inch. Original floor need not be replaced, merely resurfaced; heavy machinery and equipment not moved at all.

SURCO

• *For further information on SURCO floors for industry and home see Sweet's Files or write to the address below.*

SURFACE COATINGS, INC., 110 Pear Street, S.E., Atlanta, Georgia

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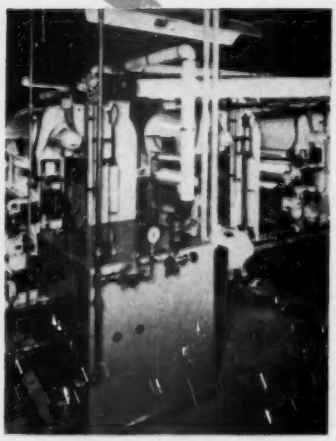
THE BIGGEST CHANGE-OVER SINCE DIRECT MOTOR DRIVES

SPEEDYLECTRIC Steam Generators for Process Steam.



Like the momentous change from the old jungle of belts and shafts to individual motor drives, so the Speedylectric Steam Boiler placed beside equipment using process steam, starts a new trend. The maze of high-pressure steam mains and returns, with countless control valves and separators, are eliminated.

Modern plants are finding the use of low pressure boiler plants for space heating and Speedylectric boilers to provide process steam offer both first cost and operating economies . . . hold down labor costs . . . allow central heating boilers to shut down completely during warm weather, with added savings.

If your plant uses process steam, it will be to your advantage to investigate Speedylectric "Steam at the flick of a switch". There's a model with pressure and capacity right for your needs.

REPRESENTATIVES IN ALL INDUSTRIAL AREAS

Livingstone Engineering Company

Manufacturers of Steam Generator

100 Grove Street • Worcester 5, Mass.

Fill Out and Attach To Letterhead

☐ Send me complete details on Speedylectric Boilers for Process Steam.

☐ Have a representative call for appointment. We need Lbs./Hr. steam at psi pressure.

Name ..... Title .....

EQUIPMENT REVIEW

Begins on page D-56

84

PROTECTIVE SHEET is made by reinforcing rubber with steel sheet. In some applications it outwears steel, according to maker. Easily and quickly installed. Protects all kinds of equipment against abrasion and corrosion for long periods. *Magic Chemical Co.*

85

PORTABLE HEATER is oil fired. Designed for isolated, exposed, and partially exposed locations. Can be moved by one man to desired location. All you do is plug it into a 110/115-volt a-c outlet to produce up to 190,000 btu. per hour. A blower on top draws in air, forces it down and over a heat exchanger where it is blown out through openings in the sides. *Cauhorn Distributing Co.*

86

PULL-TYPE SPREADER is designed for applying sand, cinders, and ashes to icy walks, driveways, loading platforms, and similar areas. The unit has a tow hitch to fit any truck for easy attachment or removal. Self-powered by its own traction. *Baughman Mfg. Co.*

87

ELECTRIC HEATER is designed to prevent pipe freezing in pump houses. The sealed-in, cast-aluminum heating element assures safe operation because there are no exposed, red-hot wires. A built-in thermostat regulates the temperature. *Electromode Corp.*

88

CONTROL SWITCH permits Magic Doors to be installed where explosion hazards exist. Designed to actuate automatic door-control mechanisms, the switch is enclosed in a cast-iron housing meeting NEMA Type VII, Class 1, Group C and D requirements. *The Stanley Works.*

89

RESPIRATOR has twin cartridges for protection against organic vapors or dust. Made of soft rub-

For more about these products, circle item numbers on Reader Service card next to back cover.

AIR POWER

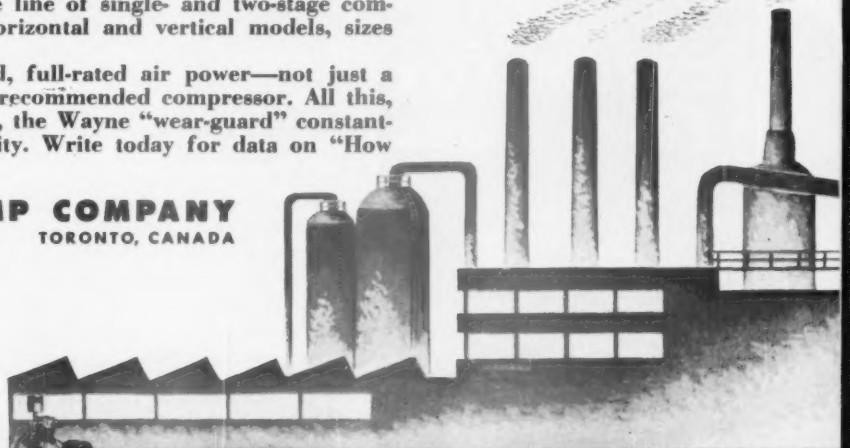
BUILT FOR YOUR NEEDS...

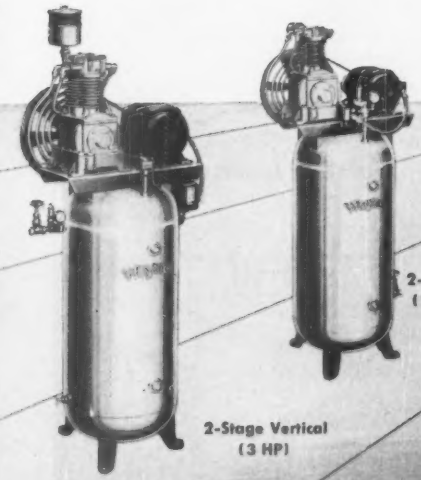
WAYNE *Job-Engineered* COMPRESSORS

NAME YOUR air requirements—we'll apply the Wayne Air Compressor to the job. Your air capacity, air pressure, horsepower and other requirements are related to one of the Wayne complete line of single- and two-stage compressors, high- and low-pressure types, horizontal and vertical models, sizes from fractional to 10 hp.

Wayne gives you pre-tested, guaranteed, full-rated air power—not just a theoretical displacement rating—for each recommended compressor. All this, plus longer-service automotive-type pistons, the Wayne "wear-guard" constant-level lubrication, and extra cooling capacity. Write today for data on "How to Select an Air Compressor."

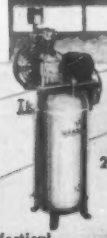
THE WAYNE PUMP COMPANY
SALISBURY, MARYLAND TORONTO, CANADA





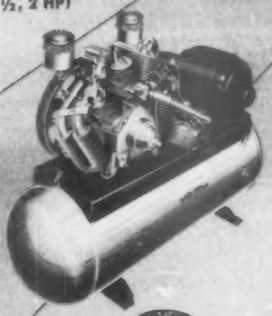
2-Stage Vertical
(3 HP)

2-Stage Vertical
(1, 1½, 2 HP)



2-Stage Low-Pressure
(1½, 3 HP)

2-Stage Horizontal
(1, 1½, 2 HP)



2-Stage Horizontal
(7½, 10 HP)

2-Stage Low-Pressure
(1½, 3, 5 HP)

2-Stage Horizontal
(3, 5 HP)

2-Stage Horizontal
(7½, 10 HP without Tank)

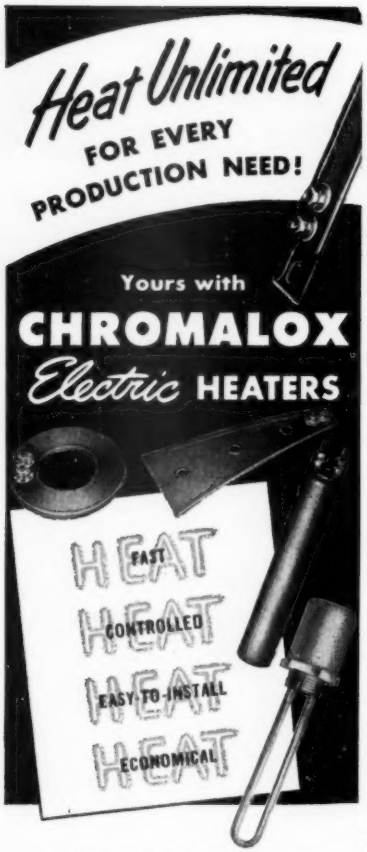
Wayne
NATION WIDE SERVICE

LIFTS

HOSE REELS

LUBRICANT DISPENSERS

INDUSTRIAL PUMPS



Need heat for production or processing? Chromalox Electric Heaters are your quick and economical answer. Over 15,000 types, sizes and ratings to choose from to give working temperatures up to 1100° F. Temperatures controlled precisely by either manual or automatic thermostatic controls. No steam-lines, no boilers or expensive equipment to install!

WRITE FOR

Handbook "101 Ways to Apply Electric Heat." It suggests many uses for Chromalox Electric Heater.

EDWIN L. WIEGAND CO., Industrial Division
/518 THOMAS BLVD., PITTSBURGH 8, PA.

Send me the illustrated booklet "101 Ways To Apply Electric Heat." ID-37-A

Name_____
Company_____
Street_____
City_____ Zone_____
State_____
I use heat for_____

CHROMALOX
THE BEST IN ELECTRIC HEAT

ber to provide snug, leakproof fit. Cartridges can be changed easily by unscrewing retainer caps. Because there are no outer screens or covers, filters' life is prolonged and breathing resistance is reduced, maker says. *Chicago Eye Shield Co.*

90

MESSAGE REPEATER uses a magazine of magnetic tape. When activated by remote control, it automatically and continuously repeats messages from 15 seconds to 15 minutes in length. The magazine fits any standard tape recorder. Can be activated by a photo-electric cell, floor mats, or driveway hoses like those in gas stations. *Cousino, Inc.*

91

POWER DRIVE for fast, efficient operation of hand pipe threaders, cutters, and reamers has an aluminum housing to reduce weight. Converts hand tools to power tools in the shop or on the job anywhere. Capacity—⅛- to 2-in. pipe, ¼- to 1½-in. bolts; with universal drive shaft, geared die stocks, and cutters up to 12 inches. *Toledo Pipe Threading Machine Co.*

92

HEATING PANEL has a strong smooth, glass surface giving infra-red radiant heat. It is suitable for operation at temperatures as high as 350 C. The heating element is uni-directional and backed by an aluminized steel reflector. *Corning Glass Works.*

93

SKYLIGHTING SYSTEM is designed to pass sun's desirable rays and reject undesirable heat and glare. It's called Toplite. Prisms in the prefabricated glass units are the key to daylight control. Toplite takes advantage of the fact that on darkest days natural illumination of a roof's exterior surface is more than twice that of exterior wall surfaces. *Kimble Glass Co.*

➤ **For more about these products, circle item numbers on Reader Service card next to back cover.**

Clogged Drains?

Saves Torn-up Plumbing Saves on Outside Help

HYDRAULIC WATER RAM

(Can pay for itself in one application)

Enjoy 30 Day FREE TRIAL!

1. No chemicals, no snakes, no electric cables, no pushing through, no costly excavations or pipe replacements.
2. Uses IMPACT—a basic scientific principle of POSITIVE HYDRAULIC POWER.
3. Works perfectly on clogged toilets, sinks, sewers, etc. Services up to 6" pipe.
4. Thousands used in institutions and industry. 3000 have been furnished to government agencies.
5. Prove it to yourself! We accept orders subject to 30 days trial in your plant.

Write for Free Details to Dept. FM-6

HYDRAULIC MANUFACTURING CO.
KIEL, WISCONSIN

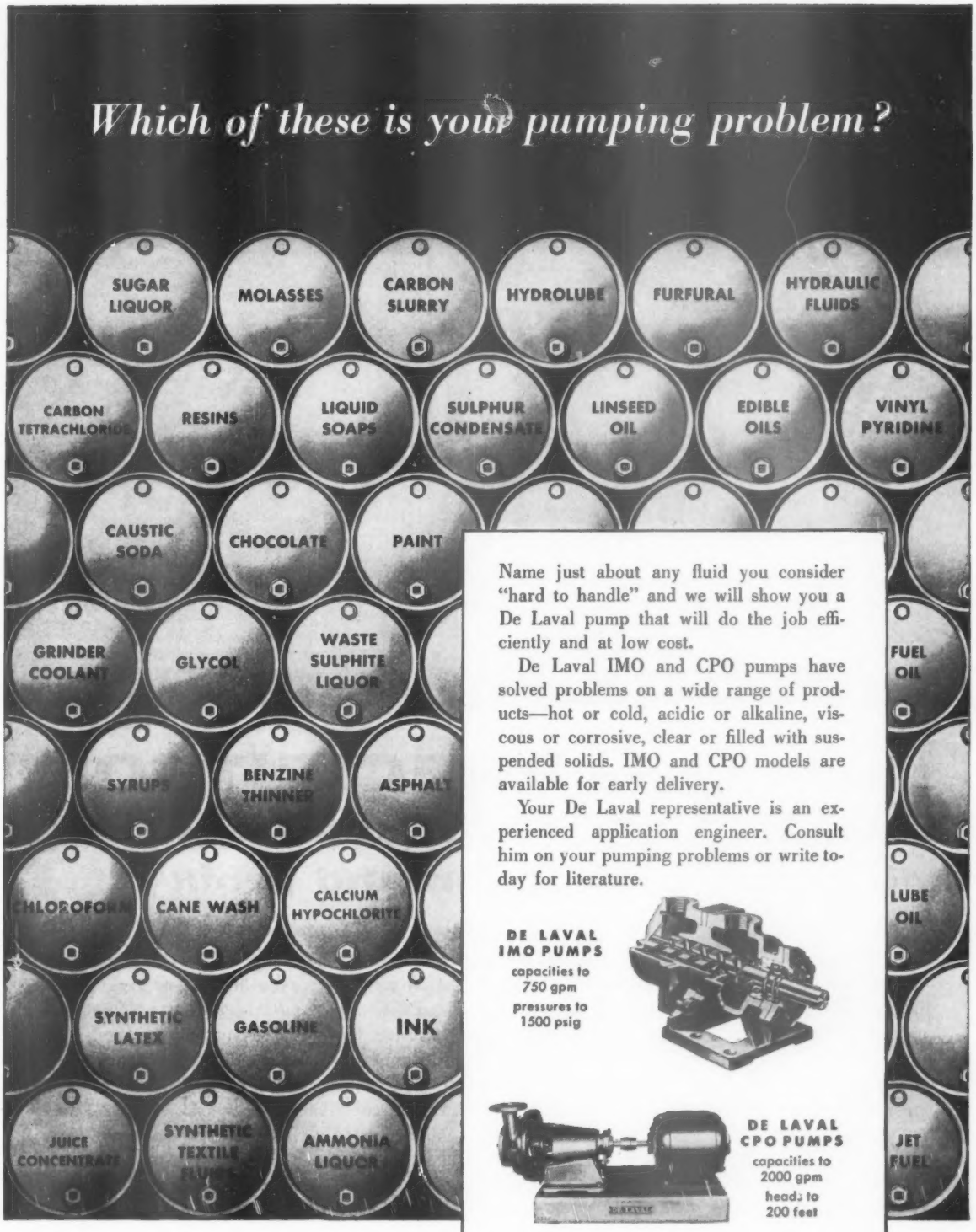
GETS-A-LITE GUARD and GUIDE Quickly and Easily Installed by Anyone — No Tools Needed!

- Simply slip GETS-A-LITE GUARD AND GUIDE over the fixture, as illustrated.
- Made of indestructable spring steel wire. Nothing to break, get out of order or replace. Will last indefinitely.
- Once installed, GETS-A-LITE GUARD AND GUIDE is NEVER removed.
- Nothing to unlock, fuss with or lock, when changing lamps.
- GETS-A-LITE GUARD AND GUIDE actually steers lamp into socket, enabling maintenance man to change lamp in 10 seconds!
- Available for 40 watt and 100 watt fluorescent lamps.

Contact Your Electrical Wholesaler, OR

GETS-A-LITE Company — Dept. FM64
3865 N. MILWAUKEE AVENUE
CHICAGO 41, ILLINOIS

Which of these is your pumping problem?



Name just about any fluid you consider "hard to handle" and we will show you a De Laval pump that will do the job efficiently and at low cost.

De Laval IMO and CPO pumps have solved problems on a wide range of products—hot or cold, acidic or alkaline, viscous or corrosive, clear or filled with suspended solids. IMO and CPO models are available for early delivery.

Your De Laval representative is an experienced application engineer. Consult him on your pumping problems or write today for literature.

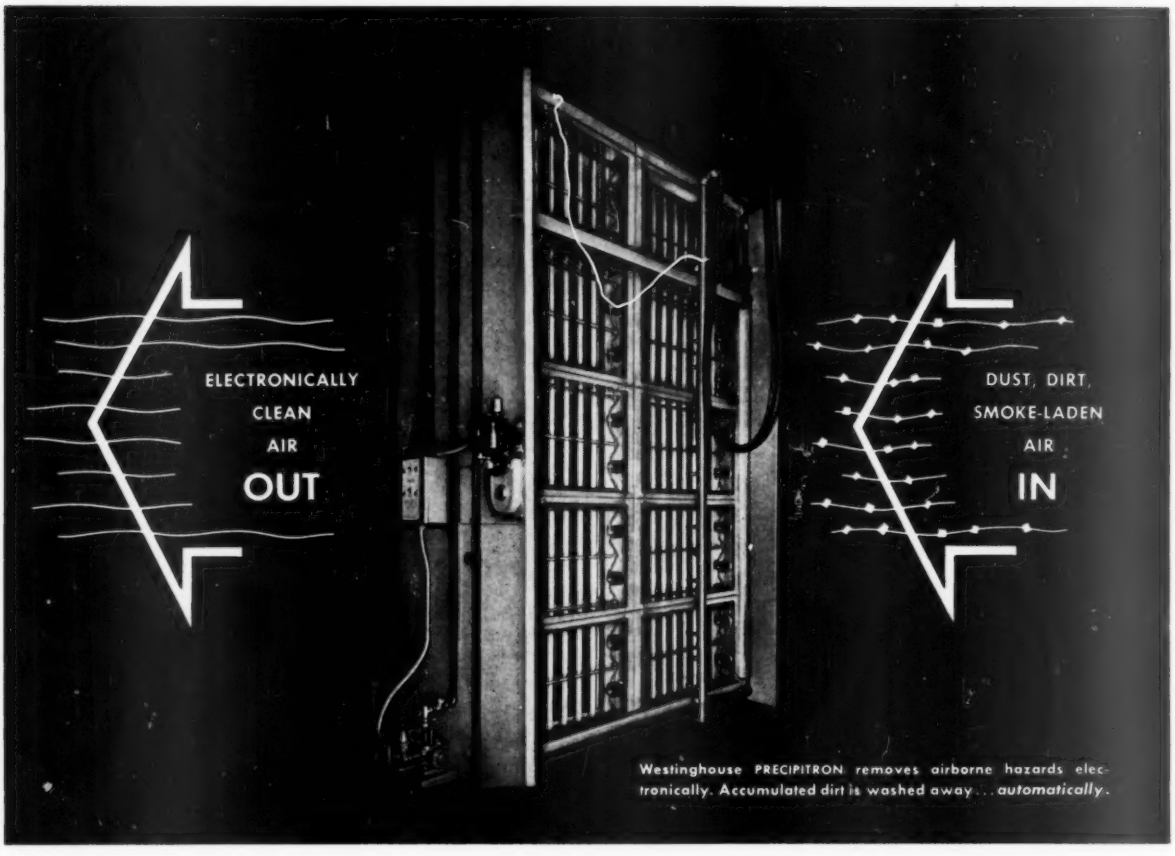
DE LAVAL IMO PUMPS
capacities to 750 gpm
pressures to 1500 psig

DE LAVAL CPO PUMPS
capacities to 2000 gpm
heads to 200 feet

DE LAVAL *Pumps*

DE LAVAL STEAM TURBINE COMPANY
804 Nottingham Way, Trenton 2, New Jersey

DL 230



Westinghouse PRECIPITRON®

cuts plant upkeep . . . boosts equipment life . . . ups production and profit

Westinghouse PRECIPITRON is the most efficient air cleaner on the market today . . . removes 90% or more of all the airborne dust, dirt and smoke that hamper industrial operations. Applied to your own operation, PRECIPITRON means (1) peak output through fewer rejects, greater control of product quality . . . (2) dollars saved on plant and machinery maintenance, servicing of dirt-sensitive equipment . . . (3) less employee absenteeism because of the cleaner, more healthful atmosphere.

Westinghouse PRECIPITRON with motorized washer is *entirely automatic*—cleans the air entering your plant . . . cleans itself, too. A low-cost washing device makes PRECIPITRON the easiest air cleaner to service. After a few weeks' dust collection, a push-button control sets a moving wash nozzle in action. A needle spray scours all PRECIPITRON collector plates *automatically*. There are no parts to take out, wear out or replace . . . nothing to clean by hand!

Cleaner air means greater profits for you, better working conditions for employees. Let Westinghouse air cleaning experts show you how easily PRECIPITRON can bring these benefits to your plant. Contact your nearest Westinghouse-Sturtevant office or write: Westinghouse Electric Corp., Sturtevant Division, Hyde Park, Boston 36, Mass.

WESTINGHOUSE AIR HANDLING

YOU CAN BE SURE...IF IT'S Westinghouse

J-80404

Warehouse kept *Spic and Span* by INVINCIBLE Vacuum Cleaner

Model 450 removing sawdust at the Davis warehouse

The same Invincible unit collecting floor litter

Davis Plywood Corp. of Cleveland, Ohio, avoids the dust problem in its ultra modern warehouse by using a Model 450 Invincible Vacuum Cleaner. If dust collected on their stored plywood, it would mar its highly finished surfaces. Manual sweeping cannot do the job, since it causes much of the dust to rise, and then resettle on the plywood, floors, bins and beams. But, as the Davis warehouse superintendent reports, "The Invincible unit *traps all the dust* inside the vacuum cleaner. It does a better job faster".

This installation is typical of thousands in all major industries where Invincibles have licked dust problems that were reducing production, increasing rejects or impairing employee morale and safety.

Invincible machines are also invaluable production tools for removing, reclaiming or conveying scores of industrial materials. An experienced Invincible engineer will gladly advise you, without obligation, about the application of Invincibles to your maintenance or production problems.

FREE BOOKLET

tells all about Invincible Machines for industry. Write for it.

INVINCIBLE VACUUM CLEANER MFG. CO.

DOVER, OHIO

OVER 50 YEARS THE LEADER IN INDUSTRIAL VACUUM EQUIPMENT

FIRE!

PUT IT OUT IN SECONDS

with a Kidde Portable extinguisher

Unless you get the jump on fire the minute it starts, you stand a good chance of kissing your business good-bye.

That's why it's so important to have a Kidde portable extinguisher near *every* fire hazard in your plant.

Protect motors, electrical equipment, flammable liquids and machinery with Kidde portables. Then, when fire strikes, you're ready for it.

Just grab a Kidde CO_2 or dry chemical portable, aim the horn, pull the trigger, and—Whoosh! No more fire!

Your *next* fire could be your *last* . . . Contact Kidde today!

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The words 'Kidde', 'Lux', 'Lux-O-Matic', 'Fyre-Freez' and the Kidde seal are trademarks of Walter Kidde & Company, Inc.

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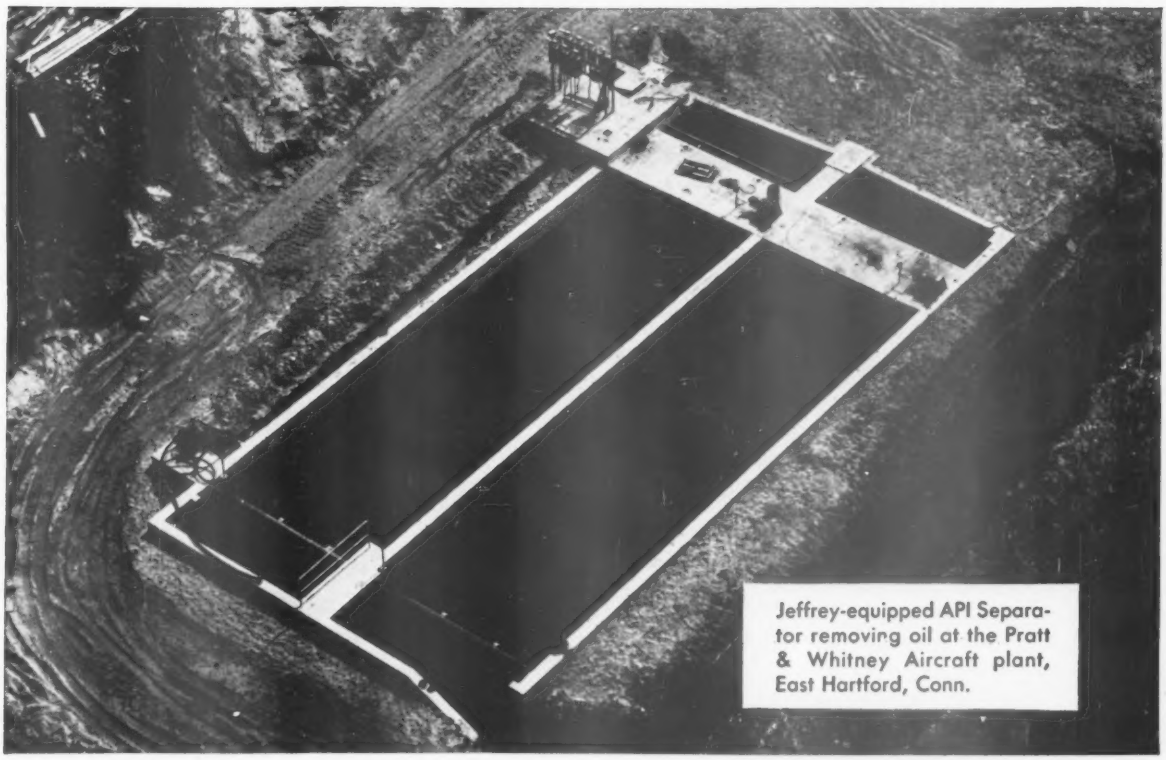

Jeffrey-equipped API Separator removing oil at the Pratt & Whitney Aircraft plant, East Hartford, Conn.

JEFFREY has the answer to pollution problems

Are state or federal anti-pollution laws giving you headaches? Then call on Jeffrey Sanitary Engineers for practical relief. A Jeffrey-designed installation will neutralize your industrial wastes efficiently. Here's how:

CHEMICAL DOSING: Jeffrey WAYTROLS, Bin Check Valves and Vibrating Feeders assure continuous, automatic dosage.

MIXING: Jeffrey Flash Mixers, with turbine type impellers, mix chemicals thoroughly with wastes.

FLOCCULATION: Jeffrey FLOCTROLS coagulate particles and promote rapid settling.

SETTLING: Jeffrey automatic, continuous Sludge Collectors scrape deposit to sump at end where it is pumped out and de-watered or sent to lagoons.

Hundreds of industrial wastes treatment plants throughout the nation are now Jeffrey-equipped. Scores of industries have found Jeffrey's wide engineering experience and broad line of proved equipment the best answer to pollution problems.

Write for descriptive literature.

THESE JEFFREY UNITS WILL HANDLE YOUR INDUSTRIAL WASTES:

- FLOCTROLS
- Bucket Elevators
- Bag Elevators
- Sludge Collectors
- Sludge Elevators
- Lime Pulverizers
- Grit Collectors & Washers
- V-Bucket Collectors
- Specific Gravity Separators
- Transmission Machinery
- Scum Removers
- Oil Separators
- Oil Skimmers
- Chemical Feeders
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ESTABLISHED 1877

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sales offices and distributors in principal cities

PLANTS IN CANADA, ENGLAND, SOUTH AFRICA

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Today we are all aware of the disastrous and far-reaching effects of a major industrial fire. Owners . . . management . . . employees . . . customers . . . almost every one suffers, in one way or another, when a serious fire strikes.

Could it happen to your plant? Now is the time to take a long, close look at your plant's fire protection measures. Remember, the local fire protection ordinances normally only set minimum standards. Compliance with these ordinances is no guarantee of fully adequate firesafety.

One way to be absolutely sure of the efficiency of your plant's fire protection facilities is to call in an expert C-O-TWO Fire Protection Engineer. He is ready and willing to help you with any or all industrial fire hazard problems.

There is a personal sense of responsibility inherent with C-O-TWO Fire Protection Engineers that assures you of fully adequate firesafety . . . a definite plus in your behalf. Whether it's fire detecting or fire extinguishing . . . portables or built-in systems . . . C-O-TWO means top quality backed by experienced engineering that results in operating superiority for you at all times.

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Don't take chances with your investment. Secure the benefits of highly efficient fire protection engineering today . . . our extensive experience over the years is at your disposal without obligation. Get the facts now!

C-O-TWO

MANUFACTURERS OF APPROVED FIRE PROTECTION EQUIPMENT

Squeez-Grip Carbon Dioxide Type Fire Extinguishers
Dry Chemical Type Fire Extinguishers
Built-In High Pressure and Low Pressure Carbon Dioxide Type Fire Extinguishing Systems
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Jenkins cast steel Valves

for dependable economy

in higher pressure

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Mounting pressures and temperatures in power generation and industrial processing call for Cast Steel Valves. For this increasing need, Jenkins offers a wide selection of patterns that have met the test of the toughest services throughout industry.

In these valves, Jenkins provides a wide margin of strength and safety beyond ratings. Special refinements in design extend their service life, assure long, trouble-free performance. Efficiency and low maintenance records measure up to the high standards established for all valves developed by Jenkins Valve *specialists.*

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Janitrol Gas-Fired Unit Heaters

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AT LOWER COST

In thousands of new and old plants, large and small, Janitrol Unit Heaters are making substantial dollar savings in operating costs year after year.

Hundreds of documented case histories show that original Janitrol installations can be as much as 50% less than the cost of a central heating system.

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- EASY TO ADD UNITS AS NEEDED
- UNITS EASILY RELOCATED
- OPERATE WHERE AND WHEN NEEDED
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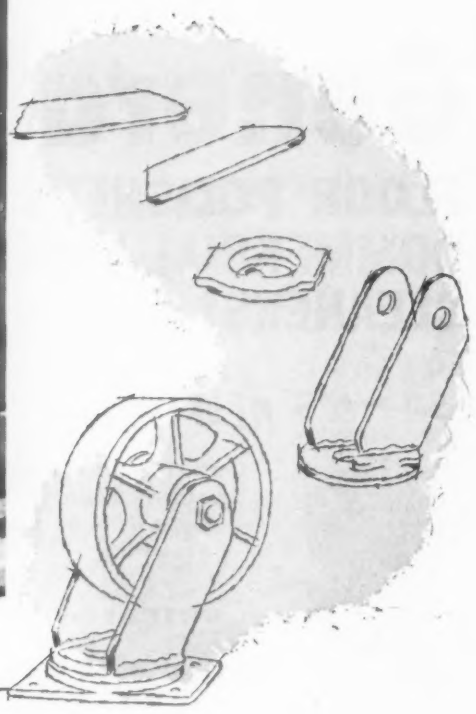
COLUMBUS 16, OHIO In Canada: Alvar Simpson Ltd., Toronto 13, Canada

ALSO MANUFACTURERS OF

Surface INDUSTRIAL FURNACES, *Kathabar* HUMIDITY CONDITIONING



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Average welding speed is 120 in. per minute—Once clamped, the parts are welded in less than ½ minute.

Used as welded—Free from spatter and flux entrapment, the need for finishing is eliminated.

Cut costs—Fewer production steps have made possible labor savings up to ½ the former costs.

Sigma welding is just one of the welding processes developed by LINDE'S research and years of experience. HELIARC, sigma, and UNIONMELT welding form a top notch fabricating team which is now setting a new peak in industrial production. For small shops or huge production lines, from carbon steel to complex alloys and non-ferrous metals—there is a LINDE electric welding process to do the job efficiently and economically. Your local Linde representative will help you determine the best welding process for your job. Call him today for more information.

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FLOOR POLISHERS AND COMMERCIAL VACUUM CLEANERS!

Waxes!
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More Horsepower! *More* water lift! *More* air volume! 1¼ H.P. By-pass Air Cooled motor for quicker . . . more powerful . . . trouble-free operation on dry and wet pickup!

HOSE ATTACHES IN ½ SECOND FLAT

Revolutionary ball bearing, swivel, snap attachment is world's quickest by stop-watch test! Ends coupling and uncoupling time-waste!

General FLOORCRAFT, INC.
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MAKE ALL FLOORS

METAL, CONCRETE, AND WOOD

SLIP-PROOF

WET OR DRY

USE **R-MIR-DEK**

NON-SLIP COATING

FOR ALL FLOORS, STAIRS, RAMPS, AREAS AROUND MACHINERY AND LOADING PLATFORMS.

R-MIR-DEK NON-SLIP COATING is the only lightweight safety floor coating that is fire retardant, anti-corrosive, easily applied, and oil, grease, alkali, and acid-resistant. Compounded of durable phenolic resins and polymerized oils with everlasting aluminum oxide granules added. Available in white, olive drab, red, light and dark grey, sea grey, brown, regular and navy blue, black, and green.

FREE! 2-color R-Mir-Dek illustrated brochure describes this lightweight, safety floor coating. Write to Dept. FM-6

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Sensational NEW features

FOSTORIA LOCALITE

The Perfect Lighting Tool for Machine Assembly Inspection

$8.12 Each
In std. pkg. of 8
Less $10.50 ea.

MODEL 2-WX-700
Overall Length 31"

Directs Light Exactly as Needed

Reflector—New bell ventilated shape with 5½" orifice. Rotates 360°. Accommodates 100 watt A-21 or R-30 lamps. Also PAR-38, R-40, RS-40. Available with lens, if desired.

Arm Joints — New patented tension disc design. Easy, smooth action with only one hand. Available with 1, 2 or 3 arms.

Base—Universal for vertical or horizonal mounting. Also adaptable to outlet boxes. Collet revolves 360°.

Wiring—Medium screw porcelain socket. "T" rated toggle switch. 8 ft. POT-52 18-2 heavily insulated oil resistant wiring with molded plug.

Finish—Gray baked enamel. Reflector interior, high temperature White.

WRITE for complete catalog of Localite models for every industrial use.

THE FOSTORIA PRESSED STEEL CORPORATION
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Localites available through wholesalers everywhere

LOCALITE fostoria for Light ON the Job

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how a dust bowl's manpower problem led to a...

NEW CONCEPT OF PRODUCTION FOR BIGGER PROFITS

● No one wanted to work in the "dust bowl" reclaim department of an Eastern plant where graphite and silicon carbide materials are crushed, pulverized, separated and bagged.

Then a Dracco Dust Control System was installed to clear the plant's atmosphere of dust clouds created by crushers, pulverizers, dryers, and other processing units. Result: Dracco meant the end of the manpower procurement problem!

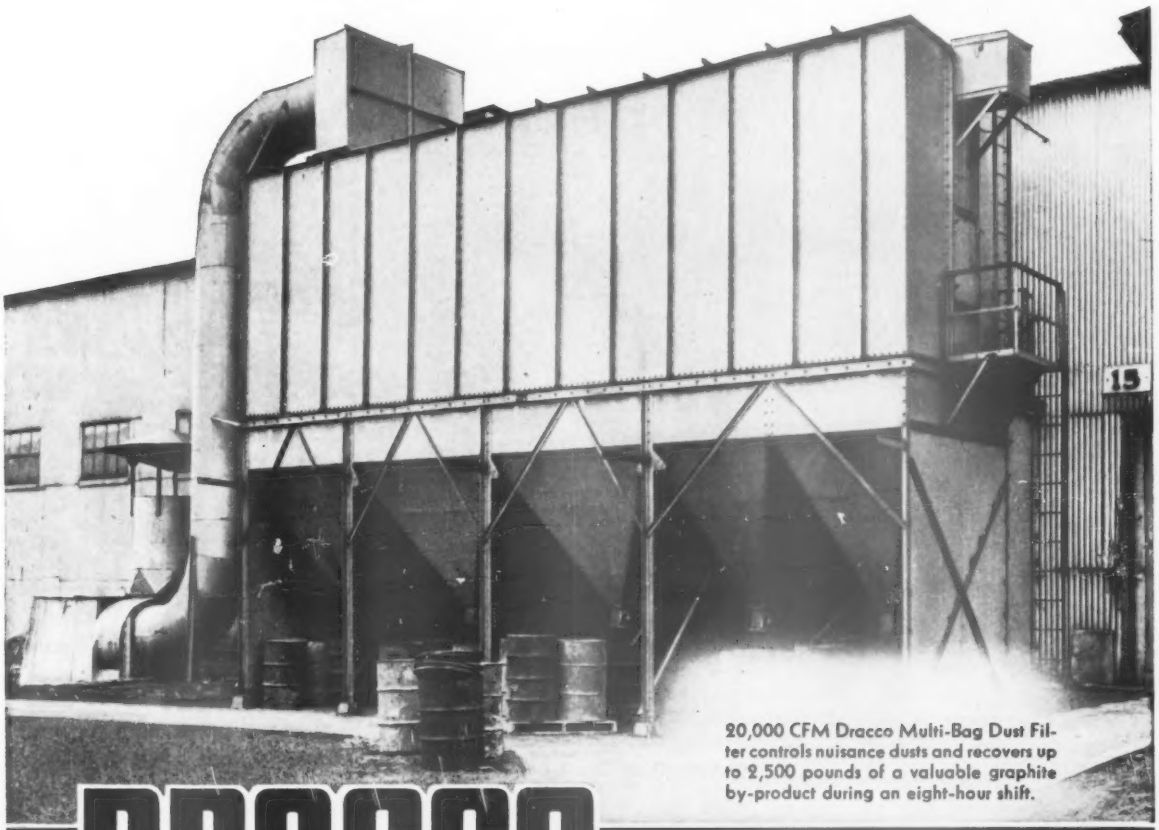
Shortly thereafter, plant management capitalized on the versatility of their Dracco System. They conceived a new technique of integrated production for the recovery of a previously lost valuable by-product. Up to 2,500 pounds of this material is now recovered by the Dracco installation during an eight-hour shift—a profitable dust recovery operation!

Thus, another plant has come to realize increased profits by using peak-performing Dracco equipment.

Whether your problem is collecting *valuable* dusts or controlling *harmful* dusts, rely on Dracco for the engineered, profitable solution. Consult a Dracco engineer today . . . there is no obligation.

DRACCO CORPORATION
4075 East 116th Street • Cleveland 5, Ohio

Dracco Bulletin 800 contains complete technical information on "Industrial Dust Control and Recovery". Write for your copy today.



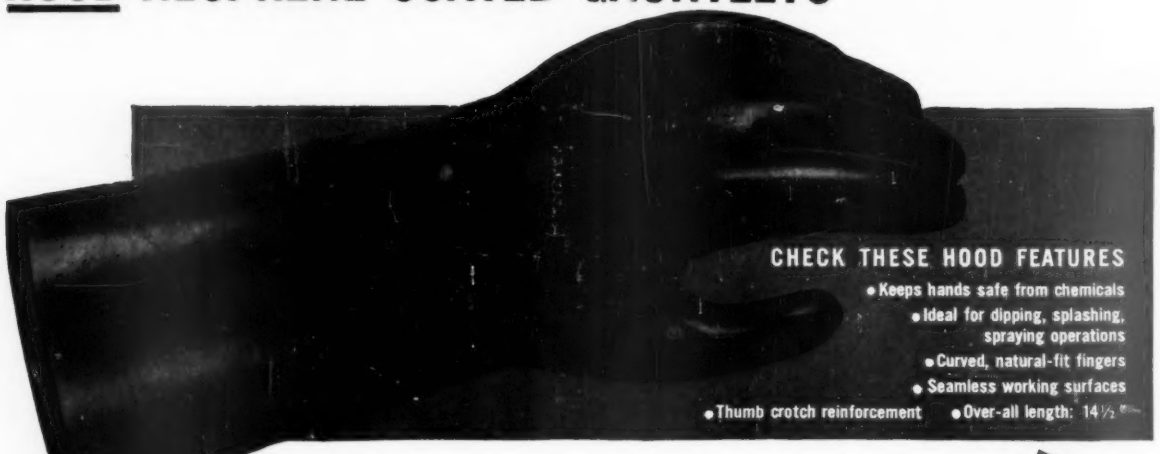
20,000 CFM Dracco Multi-Bag Dust Filter controls nuisance dusts and recovers up to 2,500 pounds of a valuable graphite by-product during an eight-hour shift.

DRACCO

Performance Proved

Airstream CONVEYORS • DUST CONTROL EQUIPMENT

...Exclusive...Industrial Weight
HOOD *NEOPRENE COATED GAUNTLETS*


CHECK THESE HOOD FEATURES
• Keeps hands safe from chemicals
• Ideal for dipping, splashing, spraying operations
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• Thumb crotch reinforcement
• Over-all length: 14½"

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Model 7703

Also available as 4703, with neoprene coated knit wrister.

Hood Rubber Company makes a complete line of rubber and plastic gloves for industrial uses. Write today for our illustrated catalog featuring the Hood Glove Guide — shows you "How to choose the RIGHT glove for EACH job".

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See this highly versatile, budget-priced striping machine that lets you lay plain or reflective materials to solve your every marking problem. Simplicity, maneuverability and "petty cash" price are the features of Reflecto-Liner, Jr. that gives you big-machine performance on any job for town and industry. Write for details today!

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ZRC (Zinc-rich Coating) rust-proofs iron and steel for years. Easy to apply — paint on or spray on — ZRC costs less than 1½¢ per sq. ft. of 100% corrosion protection.

For complete information, write Dept. F.

The SEALUBE COMPANY
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— Representatives—some territories open —

CFI DAY-LINE®

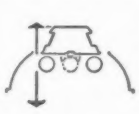
(COMFORT FOR INDUSTRY)

Easy to install

Easy to maintain

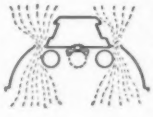
DOLLAR FOR DOLLAR, YOUR BEST PLANT LIGHTING BUY!

LOOK AT THESE VALUE-PACKED CFI DAY-LINE FEATURES!



COMFORT FOR INDUSTRY. Die-embossed apertures in reflectors provide 10% up-lighting for improved visual comfort and freedom from irritation and nervous fatigue due to eye-strain.

ALL-WHITE PORCELAIN REFLECTORS. Outside as well as inside, entire one-piece reflector is finished in snow white porcelain enamel—providing maximum high reflection surface.



COOLER, CLEANER OPERATION. A gentle flow of air passes through the apertures reducing dirt and dust deposits. This "breathing" action keeps fixture cooler, cleaner and more efficient.

TURRET* SOCKETS. Sturdy, vibration-proof Turret sockets are standard equipment on all CFI DAY-LINEs—providing positive lamp seating and simple lamp installation or removal.

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THE CFI DAY-LINE ON THE JOB. Note how uplighting cuts down uncomfortable brightness contrast. CFI DAY-LINE is available in 2 and 3 lamp (75W) open-end 8 ft. Slimline units; 2 and 3 lamp (40W) open- and closed-end 4 ft. RAPID-START Fluorescent units; 2 lamp (90W) open- and closed-end 5 ft. Fluorescent units with NO-BLINK starters.

Day-Brite Lighting, Inc., 5441 Bulwer Avenue, St. Louis 7, Missouri. In Canada: Amalgamated Electric Corp., Ltd., Toronto 6, Ontario.

"DECIDEDLY BETTER"
DAY-BRITE
Lighting Fixtures

470

SEE YOUR LOCAL ELECTRICAL CONTRACTOR

In the Palm of Your Hand...

the answer to your sanitation problems

SOLAR...
the original and still the BEST

Solar—the self-closing waste receptacle is the solution to all your waste disposal problems. Solar has no springs, weights, or hinges—nothing to repair or replace. There is only ONE moving part—the free-swinging top. Silent in operation and built to withstand tough usage, Solar cuts cleaning costs, reduces fire hazards, is always safe to use. Send for free illustrated literature today. *Buy Solar And You Get The Best.*

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PRESSED STEEL CAR COMPANY, INC.
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Please send me complete information about the new line of Solar Self-Closing Waste Receptacles.

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SOLAR-STURGES MFG. DIV. Pressed Steel Car Company, Inc.

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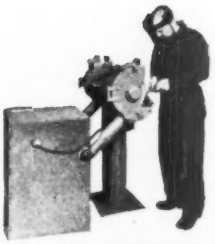
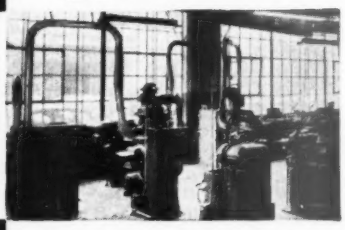


TO Complete Shop Installations



TORIT

WILL SOLVE YOUR DUST PROBLEMS

Industrial dusts are dangerous. They can damage precision machines or finished parts, create bad working conditions, reduce employee efficiency, and increase your insurance rates.

Whether it's just a single pedestal grinder or a whole battery of cut-off, grinding and polishing machines, Torit Dust Collectors will solve your dust problem—do it efficiently, economically and with a minimum of interference to your production layout.

Standard Torit Dust Collectors fit most situations and special adaptations can be quickly created, write for full information.

see our catalog in MACHINE TOOL CATALOGS

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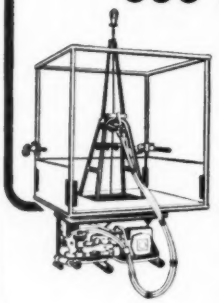
ST. PAUL 2, MINN.

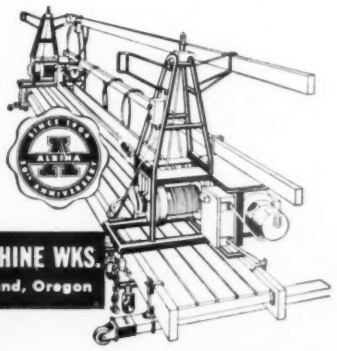
See the ALBINA

Mechanical Stirrups



Western Plant Maintenance Show
Pan-Pacific Auditorium
July 13-15, 1954
Los Angeles, Calif.—Booth 602

• We want you to see Albina Mechanical Stirrups in operation. You can judge for yourself the smooth, safe operation and the savings it affords you. Units are electric or air operated and may be used as a single stirrup. Circular models also available for tanks, stacks, etc.



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OFF-THE-GROUND MAINTENANCE TIPS

By The Patent Scaffolding Co., Inc.

Up and at 'Em in a Minute

Designed for speeding interior and exterior plant maintenance jobs, the "Fold-A-Way" Aluminum Scaffold has a base section that can be erected by one man in sixty seconds or less. Adding guard rails or intermediate sections requires only a few minutes time. Approved by Underwriters' Laboratories, Inc.

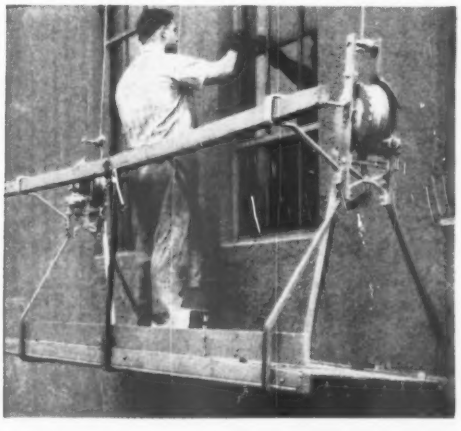
End frames swing open sideways (like the pages of a book) while the 7′-high base section is in a standing position, making an easily-managed swing of about 90 degrees.

For complete mobility, the new scaffold is fitted with 5″ aluminum, rubber-tired caster wheels. New ball-bearing, safety extension legs permit height adjustments up to 24″. The "Fold-A-Way" Aluminum Scaffold, described in Bulletin ASF-1, is manufactured by The Patent Scaffolding Co., Inc., 38-21 12th Street, Long Island City 1, N. Y.

Plenty of Standing Room Here

For machine repair and other special off-the-ground jobs, this stepladder features a 14″ x 19″ platform that gives maintenance men safest support. The "Gold Medal" Platform Stepladder is made of best grade ladder stock, and is available in 10 sizes, with platform heights from 3′ to 18′. Tested and approved by Underwriters' Laboratories, Inc.

The "Gold Medal" line also includes all types of wood and light metal ladders, designed for specific painting, cleaning, electrical, maintenance and plant repair jobs. Information on the complete line is available in Catalog L-71 from The Patent Scaffolding Co., Inc., 38-21 12th Street, Long Island City 1, N. Y.



How to Reach Those Outside Jobs

For painting and window washing, for work on chimneys, tanks or sheds, the ideally safe answer is this "Gold Medal" Junior Safety Swinging Scaffold. Made of steel or aluminum for medium-duty work, the scaffold provides platforms from 16′ to 22′ in length.

Other features: 100′ to 200′ of steel cable, positive locking pawls, raised by rachet lever. Approved by Underwriters' Laboratories, Inc., "Gold Medal" Junior Safety Swinging Scaffolds are manufactured by The Patent Scaffolding Co., Inc., 38-21 12th Street, Long Island City 1, N. Y.

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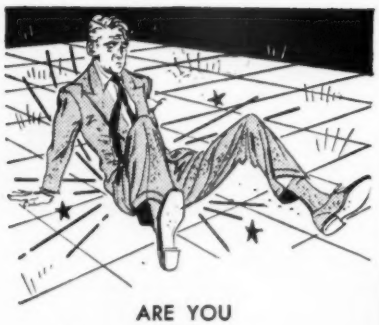

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SAFETY PRODUCTS DIVISION

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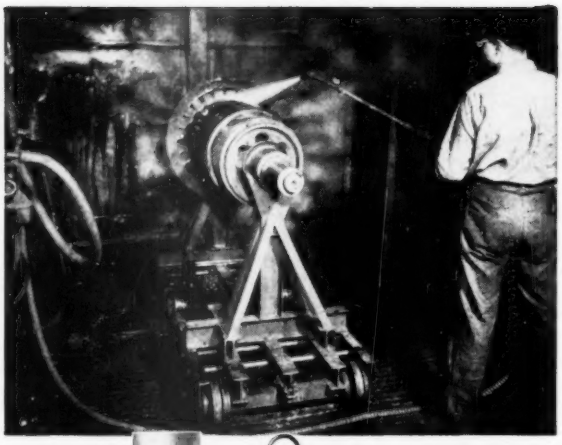

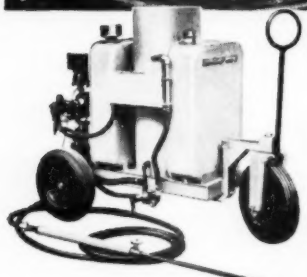

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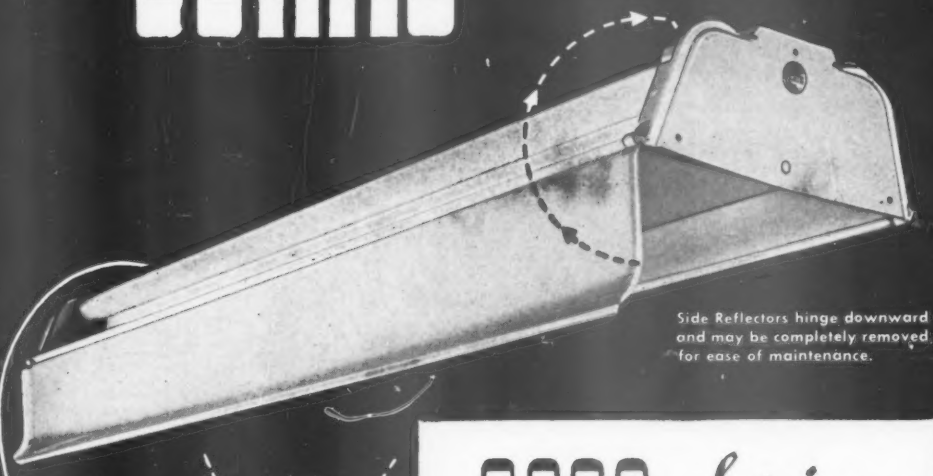
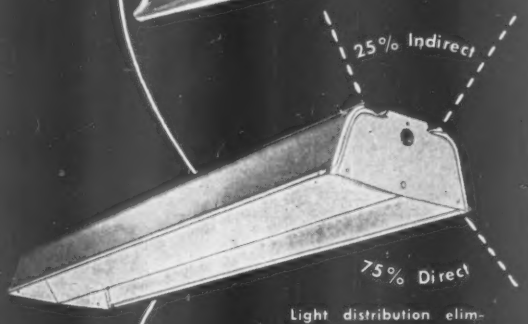


Side Reflectors hinge downward and may be completely removed for ease of maintenance.



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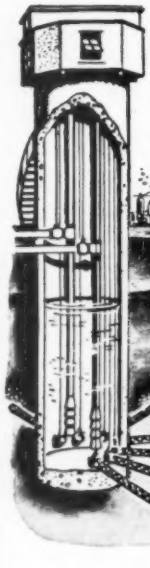

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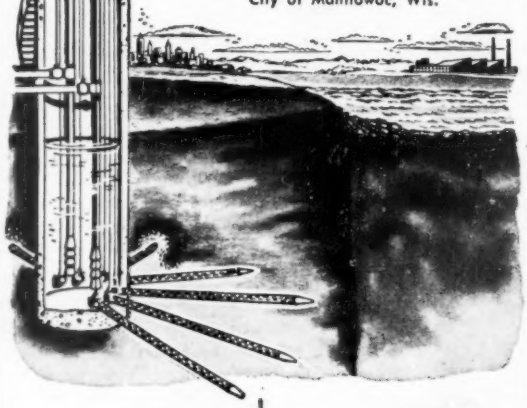

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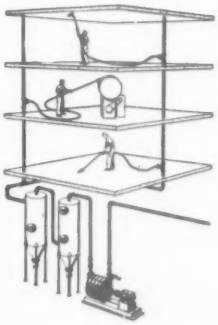

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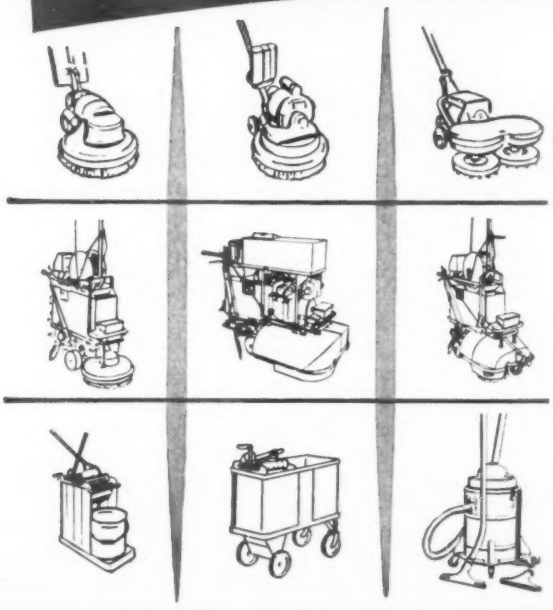
Young Radiator Company D-110

Keep your floor-maintenance men happy . . .

with *Job-Fitted* EQUIPMENT!

Choose from the COMPLETE *Finnell* Line

More than a score of models and sizes permits selection of the equipment that's exactly right for your job!



However much a maintenance man may want to do a good job, and at the same time show savings in labor costs, he's *stymied* if the machine is too small, or too large, or is otherwise unsuited to the job. Different floors and areas call for different care and equipment. That's why *Finnell makes more than a score of floor-maintenance machines.* From this complete line, it is possible to choose equipment that is correct in size as well as model . . . that provides the maximum brush coverage consistent with the area and arrangement of the floors.

Finnell makes *Conventional Polishing-Scrubbing Machines* in both concentrated and divided-weight types, each in a full range of sizes . . . a *Dry-Scrubber*, with self-sharpening brushes, for cleaning grease-caked floors . . . *Combination Scrubber-Vac Machines* for small, vast, and intermediate operations, including gasoline as well as electric models . . . *Mop Trucks* . . . *Vacuum Cleaners* for wet and dry pick-up, including a model with By-Pass Motor. In addition, *Finnell* makes a full line of fast-acting *Cleansers* for machine-scrubbing . . . *Sealers* and *Waxes* of every requisite type . . . *Steel-Wool Pads*, and other accessories — *everything for floor care!*

In keeping with the *Finnell* policy of rendering an individualized service, *Finnell maintains a nation-wide staff of floor specialists and engineers. There's a Finnell man near you* to help solve your particular floor-maintenance problems . . . to train your operators in the proper use of *Finnell Job-Fitted Equipment and Supplies* . . . and to make periodic check-ups. For consultation, demonstration, or literature, phone or write nearest *Finnell Branch* or Finnell System, Inc., 2506 East St., Elkhart, Ind. Branch Offices in all principal cities of the United States and Canada.

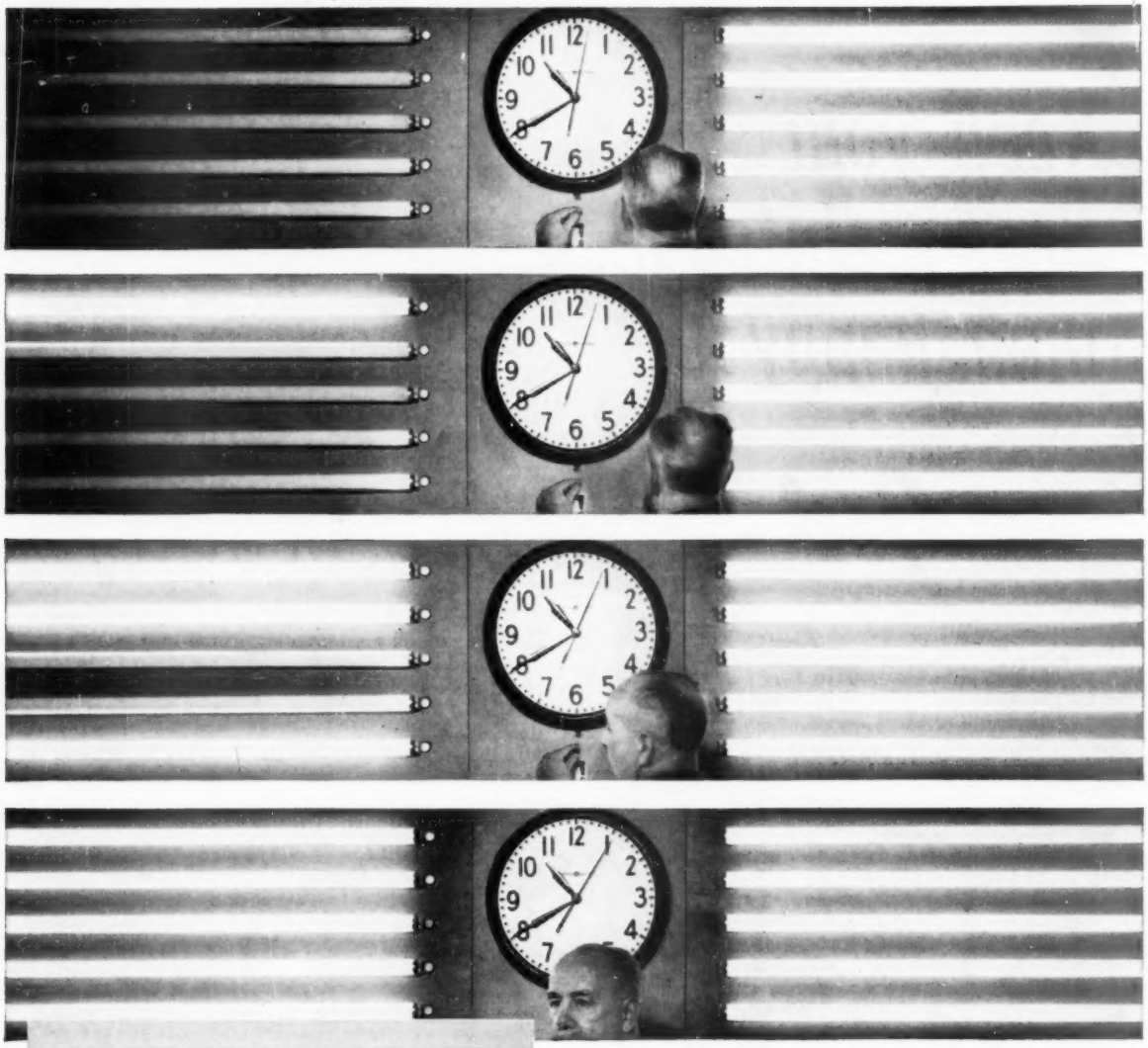
FINNELL SYSTEM, INC.

Originators of Power Scrubbing and Polishing Machines

Everything FINNELL for Floor Care

BRANCHES IN ALL PRINCIPAL CITIES

YOU EXPECT THE BEST VALUE FROM G-E FLUORESCENT LAMPS



New G-E "Rapid Start" lamps light up twice as fast as others

This series of pictures shows how General Electric can save you the annoyance of waiting for light.

All the lamps were started as the second hand on the clock reached zero. Within two seconds, the G-E Rapid Start lamps—right of the clock—were fully lighted. It was nearly *six* seconds before all the regular lamps, left, lit up.

G-E Rapid Start lamps eliminate the starter, cause of up to half of regular lighting maintenance troubles. They have long life, too. Reason: a triple-coil cathode that holds more starting chemical.

General Electric Rapid Starts are another example of why you can *expect* the best value from G-E fluorescent lamps. For free folder, "Facts About Rapid Start", write: General Electric, Dept. 166-FM-6, Nela Park, Cleveland, O.

GENERAL ELECTRIC

HERE'S A HANDY POSTCARD THAT WILL HELP YOU—

GET MORE INFORMATION

How to use this Reader Service Card . . .

The bottom of this page is a postcard—you'll note that the page has been perforated so that you can tear it out easily. This postcard makes it easy for you to get more information on anything that's advertised in FACTORY, or listed in FACTORY's New Catalog Section, or in FACTORY's New Equipment Section.

New Catalog Section (in three parts): Starts on pages B-28, C-36, and D-29. FACTORY's Editors look at scores of Catalogs each month, and select those that we consider will be most helpful to you. Look over the descriptions of the various catalogs. You'll note that each catalog is identified by a number. In the New Catalog Section of the postcard, circle the numbers corresponding to the number of the catalogs you want. You'll get them—without obligation—direct from the manufacturer.

Equipment News Review: Starts on page D-56. Here FACTORY's Editors have selected new equipment items from all of the past year's issues that will help you solve your 195x planning problems. Here, too, each item is identified by a number. In the New Equipment Review Section of the Postcard, circle the numbers corresponding to the numbers of the New Equipment items you'd like to know more about. You'll get information direct from the manufacturer, without obligation.

Advertising Section: Look at the advertisements in FACTORY. The postcard has numbers corresponding to page numbers. Circle the numbers on the postcard corresponding to the page numbers containing the advertisements you're interested in. *The letters L, R, T, B, locate advertisements on the page: left, right, top, bottom* in cases where more than one advertisement is on a page.

Then be sure: Fill out your name, address, and other information in the space provided, tear out the card, and drop it in the mail.

Note: This issue is in two parts. There is a Reader Service Card in both. Be sure to use this card for items in PART II only.

(Use this card only for items in Part II)

FACTORY: Send me more information about . . . **JUNE 1954 — Part II**

(Good until August 31, 1954)

. . . items in the NEW CATALOG SECTION as circled below:

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44
45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66
67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88
89	90	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105	106	107	108	109	110
111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130	131	132
133	134	135	136	137	138	139	140	141	142	143	144	145	146	147	148	149	150	151	152	153	154
155	156	157	158	159	160	161	162	163	164	165	166	167	168	169	170	171	172	173	174	175	176
177	178	179	180	181	182	183	184	185	186	187	188	189	190	191	192	193	194	195	196	197	198
199	200	201	202	203	204	205	206	207	208	209	210	211	212								

. . . items in the NEW EQUIPMENT REVIEW SECTION as circled below:

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44
45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66
67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88
89	90	91	92	93																	

. . . items ADVERTISED on the pages circled below:

B-23	B-24	B-25	B-26	B-27	B-28	B-29	B-30	B-31	B-32	B-33	B-34	B-35	B-36	B-37	B-38
B-39	B-40	B-41	B-42	B-43	B-44	B-45	B-46	B-47	B-48	B-49	B-50	B-51	B-52	B-53	B-54T
B-54B	B-55	B-56T	B-56B	B-57	B-58L	B-58T	B-59	B-60	B-61	B-62	B-63	B-64	B-65	B-66	C-23
C-24	C-25	C-26	C-27	C-28	C-29	C-30	C-31	C-32	C-33	C-34	C-35	C-36	C-36a	C-37	C-38L
C-38R	C-39	C-40	C-41	C-42	C-43	C-44	C-45	C-46	C-47	C-48	C-49	C-50	C-51	C-52	C-53
C-54	D-21	D-22	D-23	D-24	D-25	D-26	D-27	D-28	D-29	D-30	D-30a	D-31	D-32	D-33	D-34
D-35	D-36	D-37	D-38	D-39	D-40	D-41	D-42	D-43	D-44	D-45	D-46	D-47	D-48	D-49	D-50
D-51	D-52	D-53	D-54	D-55	D-56	D-57	D-58	D-59	D-60	D-61	D-62	D-63	D-64	D-65	D-66
D-67	D-68	D-69	D-70	D-71	D-72	D-73	D-74	D-75	D-76	D-77	D-78	D-79	D-80T	D-80B	D-81
D-82	D-83	D-84	D-85	D-86	D-87	D-88L	D-88R	D-89	D-90	D-91	D-92T	D-92B	D-93	D-94L	D-94T
D-94B	D-95	D-96	D-97	D-98	D-99	D-100	D-101	D-102	D-103	D-104T	D-104L	D-104R	D-105	D-106T	D-106L
D-106R	D-107	D-108L	D-108T	D-108B	D-109	D-110L	D-110T	D-110B	D-111	D-112L	D-112T	D-112B	D-113	D-114L	D-114R
D-115	D-117	D-118	Second Cover		Third Cover		Fourth Cover								

TAKE ANOTHER LOOK...

...at the advertising in this FACTORY issue

...at FACTORY's New Catalogs Section

...at FACTORY's New Equipment Section

...and then circle on this handy postcard the items you want to know more about.

It's an easy way to get information on any subject you are interested in—you can build your own data file. And you can do it without cost.

Every month in FACTORY you can use this free service to get useful literature. And every month in FACTORY's advertising pages, leading manufacturers show you new ways, better ways to cut costs, boost production.

PLEASE PRINT

NAME .....

POSITION .....

COMPANY .....

ADDRESS .....

CITY & STATE .....

FIRST CLASS
PERMIT No. 64
(Sec. 34.9, P. L. & R.)
NEW YORK, N. Y.

BUSINESS REPLY CARD

No Postage Stamp Necessary If Mailed In The United States

4¢ — POSTAGE WILL BE PAID BY —

McGRAW-HILL PUBLISHING CO., Inc.
Reader Service Department

FACTORY Management & Maintenance

330 WEST 42nd STREET

NEW YORK 36, N. Y.

MULTI-CLEAN *Method*

FLOOR TREATING MATERIAL

FLOOR MACHINES

SCRUBBING MACHINES

WET-DRY VACUUM CLEANERS

shows...

HOW TO REDUCE COSTS ON FACTORY FLOOR MAINTENANCE

ASPHALT TILE—Factory men report that the Multi-Clean Method has cut maintenance time on their asphalt tile floors by two-thirds and floor material costs by 50 per cent. Multi-Clean Asphalt Tile Preserver provides a complete U/L approved, long lasting glossy finish. . . . . Needs only two to four applications a year under normal conditions. Makes excellent base coat for waxing, if desired. Floors keep clean with ordinary dry sweeping or vacuuming and periodically damp mopping. Multi-Clean machine buffing restores original lustre.

CONCRETE—Multi-Clean Neo-Dry Concrete Sealer (rubber base) or Multi-Clean Concrete Preserver (bakelite base) fortifies concrete against abrasions, oils, acids . . . eliminates flaking and dusting. Conditions surface for heavy traffic by imparting a tough, sanitary, longer-lasting finish. Sweeping time is reduced because heavier dirt does not stick to the hard smooth finish.

WOOD—The speed and ease with which your wood floors are kept in first-class condition with the Multi-Clean Method will reduce your maintenance costs. Even under heaviest foot traffic, your floors will retain their safe, bright finish for longer periods between treatments. Ordinary sweeping will keep them clean. Periodic polishing with a Multi-Clean floor machine will remove scuff marks, and restore brightness to floors.

HOW WOULD YOU LIKE a method of floor care which shows you: (1) the proper materials to use, (2) the proper floor maintenance equipment, and (3) the correct applications for *all* types of floors and floor conditions? With these facts you can reduce floor maintenance costs. These are the facts you get with the Multi-Clean Method. In factories large and small across the nation, maintenance engineers are using the Multi-Clean Method on all types of floors. They agree—the Multi-Clean Method is the most efficient and most economical method for floor maintenance. There is a local authorized Multi-Clean distributor ready to serve you. Call him or send the coupon to us.

FREE! *Florule*

"A GUIDE TO BETTER FINISHED FLOORS"

Select the floor, turn the dial . . . at a glance the Florule tells you what Multi-Clean floor treatment to use, how to use it and what it will do for your floor. Keep the Florule handy for ready reference.

MAIL THIS COUPON TODAY!

MULTI-CLEAN PRODUCTS, INC.
2277 Ford Parkway, Dept. FM-6, St. Paul 1, Minnesota

Gentlemen: I would like the Free Florule, also information on the Multi-Clean Method for: ☐ Asphalt Tile; ☐ Concrete; ☐ Wood; _____

Name _____

Address _____

City _____ *Zone* ____ *State* _____

lighting problems SOLVED

for every plant location with a specific Benjamin Unit

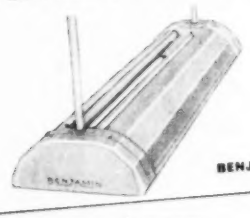
☑ THIS CHECK CHART OF BENJAMIN LIGHTING UNITS shows how lighting can be matched to every seeing task in the plant!

☐ **1.** fluorescent lighting of **GENERAL PLANT AREAS**

Over 300 combinations for matched-to-the-task lighting. Just three channel sizes and four types of reflectors form the backbone of an almost unlimited number of lighting systems for general industrial seeing tasks. Features utilization of high-light-output T12 Slimline lamps and exclusive "Springlox" Lamp-holders for lower maintenance cost through quicker lamp servicing.

BENJAMIN "Magna-Flo" Systems *described in Manual #1*

☐ **2.** fluorescent lighting to overcome **EXCESSIVE BRIGHTNESS RATIOS**



A new high in seeing comfort for industry! "Task-Master" combines greater upward flow of light with a new high of 35° lamp shielding. Revolutionary new, easier methods of installation and maintenance keep operating and maintenance costs at an all-time low.

BENJAMIN "Task-Master" *described in Manual #2*

☐ **3.** lighting of **HIGH BAYS**

A rugged lighting unit for steel mills, foundries, sheet metal works, and other locations where the lighting units must be guarded against damage from rough handling, flying metal particles, severe mechanical strain or unfavorable atmospheric conditions.

BENJAMIN "Steelite" *described in Manual #3*

☐ **4.** incandescent lighting of **GENERAL PLANT AREAS**

This unit inexpensively matches a variety of general seeing tasks; also for stairways, materials handling areas, etc. Exclusive "Turnlox" detachable reflector cuts time required for cleaning and relamping.

BENJAMIN "Turnlox" Dome Reflector *described in Manual #4*

☐ **5.** lighting for **BINS and SHELVES**

A reflector of unique design, combining uniformity of illumination with careful shielding. Uniformly lights top-to-bottom of shelves, bin tiers in stock rooms, tool cribs and book stacks. Especially adapted for the low mounting heights and narrow aisles of such locations.

BENJAMIN "Stock-Bin-Lite" Reflector *described in Manual #5*

☐ **6.** safe lighting for **HAZARDOUS LOCATIONS**

For locations listed by U.L. as Class 1 Groups C and D. Recommended for areas where explosive atmospheres or inflammable dust is found. Available in a choice of four reflectors and a variety of mountings. Especially constructed to withstand the tremendous pressure of internal lamp explosion.

BENJAMIN "Explosion-Proof" Units *described in Manual #6*

☐ **7.** approved lighting for **HUMID LOCATIONS**

Listed "Vapor-Tight" by U.L. Suitable for use in locations exposed to moisture or non-combustible dust, corrosive fumes, vapors, dust and smoke. Rugged construction, unbroken surface of Porcelain Enamel and heavy-gauge steel assure long life without breakdown or frequent servicing.

BENJAMIN "Vapor-Tight" Units *described in Manual #7*

☐ **8.** proper floodlighting for **OUTDOOR INDUSTRIAL AREAS**

The ideal all-weather unit for industrial recreational areas, ball fields, pools, etc. Highest quality outdoor illumination due to combination of large diffusing Porcelain-Enameled Steel Reflector with inner aluminum reflector.

BENJAMIN "Play Area" Floodlight *described in Manual #8*

B-215R5

☑ GET THESE FREE LIGHTING MANUALS!

- ☐ 1. General Plant Lighting (fluorescent)
- ☐ 2. Controlled Brightness for greater seeing comfort
- ☐ 3. High Bay Lighting
- ☐ 4. General Plant Lighting (incandescent)
- ☐ 5. Stock-Bin Lighting
- ☐ 6. Hazardous Locations
- ☐ 7. Humid Locations
- ☐ 8. Industrial Floodlighting

BENJAMIN ELECTRIC MFG. CO., Dept. N
DES PLAINES, ILLINOIS

Without cost or obligation, please send me Benjamin Manuals covering the subjects I have checked off at left.

NAME AND TITLE _____

COMPANY _____

ADDRESS _____

CITY _____ STATE _____

BENJAMIN

Lighting Equipment

sold exclusively through electrical distributo